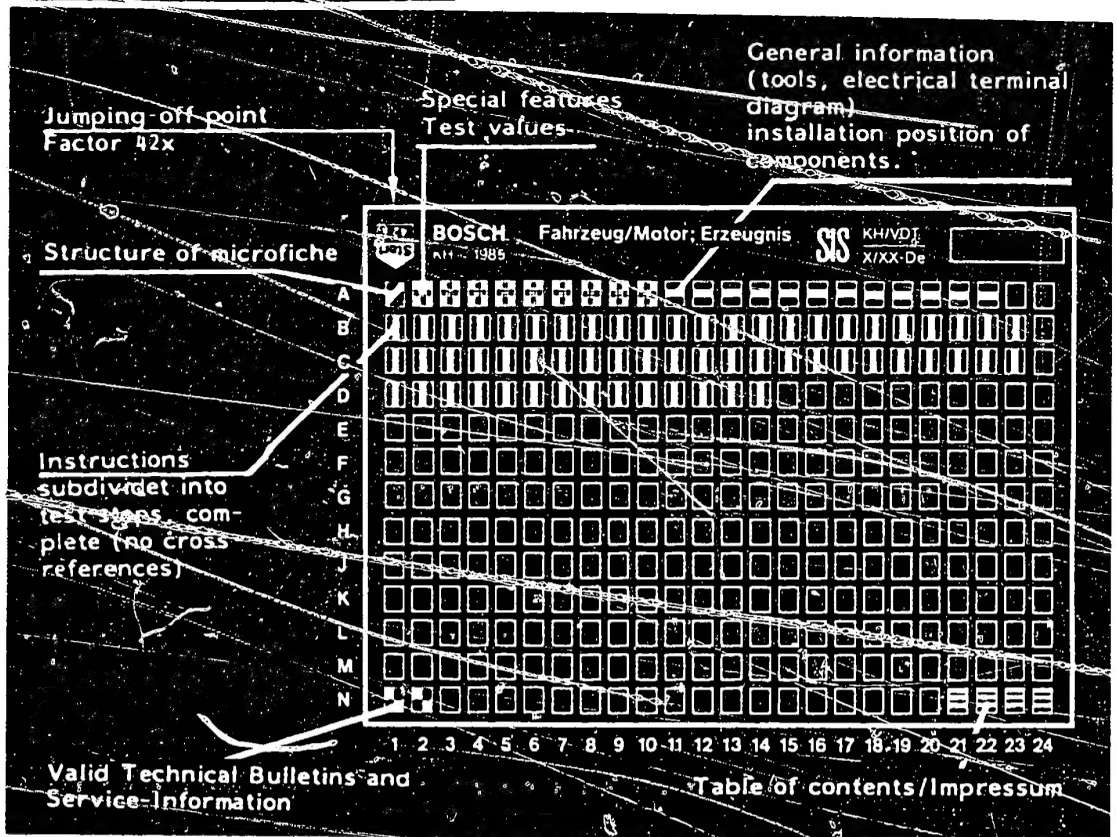
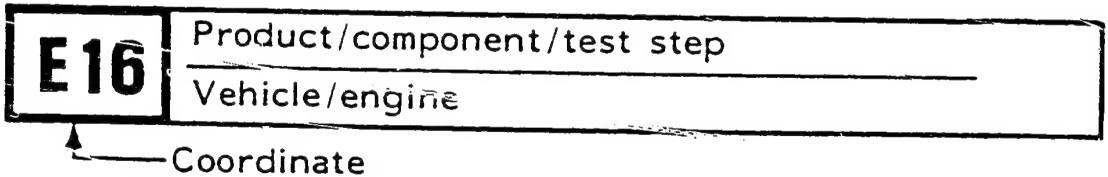


Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)



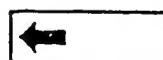
3. Limits of section



Beginning



Mid-section



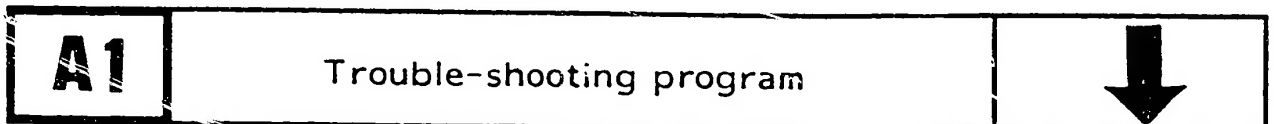
End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.



1. Special features

The following models of starting motor (GB, GD, GE, GF) are dealt with:

0 001 304 ..	6 V	0.6 kW
305 ..	12 V	1.0 kW
306 ..	12 V	1.0 kW
307 ..	12 V	1.0 kW
308 ..	24 V	1.4/1.8 kW
310 ..	6 V	0.55 kW
311 ..	12 V	1.0/1.1/1.35 kW
312 ..	12 V	1.5 kW
313 ..	12 V	1.5 kW
314 ..	12 V	1.5 kW
315 ..	12 V	1.9 kW
316 ..	24 V	1.6 kW
317 ..	12 V	1.7 kW



2. Test specifications - electrical

Part No. of starting motor	Model	No-load D10			Short circuit 2x143Ah in parallel with 10 m Ω resistor (EFAL 152, 153, term. 30/2) or 1x12 V 143 Ah			Short circuit 2x143Ah in series			Short circuit 1x6V77Ah D14			D8
		V	< A >	min ⁻¹	V	A	Torque ¹⁾ > Nm	V	A	Torque ¹⁾ > Nm	V	A	Torque ¹⁾ > Nm	Minimum voltage for solenoid switch ²⁾ V
0 001 304 ..	GD 6 V 0,6 kW	5,5	75	4000							2,5	290...370 220...300	7 5,5	3,5
305 ..	GD 12V 1kW	11	50	5500	8,5 7,5	360...450 320...400	18 17							7,5
306 ..	GE 12V 1kW	11,5	50	5500	8,5 7,5	360...450 320...400	18 17							7,5
307 ..	GE 12V 1,3kW	11,5	70	6300	7 6	500...610 430...530	22 18,5							7,5
308 ..	GE 24V 1,4kW	23,5	35	6000				20 19,5	230...320 210...300	22 21				15
308 1..	GE 24V 1,8 kW	23,5	50	6000				20 19	310...400 300...380	26 25				15
312 ..	GE 12V 1,5kW	11	115	8500	5 4	660...780 520...620	15 12							7,5
312 1..	GB 12V 1,5kW	11,5	85	8500	6 5	650...730 530...720	19 16							8

1) Only for test benches with torque tester

2) Minimum pull-in voltage for solenoid switch for tooth / tooth connection (meshing travel of pinion max. 2 mm).

A3

Test specifications - electrical

G-starting motors 0 001 30. ..., 0 001 31.



A4

Test specifications - electrical

G-starting motors 0 001 30. ..., 0 001 31.



Test specifications - electrical (continued)

Part No. of starting motor	Model	No-load			D10 Short circuit 2x143Ah in parallel with 10 m Ω resistor (EFAL 152, 153, term. 30/2) or 1x12 V 143 Ah			Short circuit 2x143Ah in series with 10 m Ω resistor (EFAL 152, 153 term. 30/2)			Short circuit 1x6V77Ah		D14	D8
		V	<A	>min ⁻¹	V	A	Torque ¹⁾ > Nm	V	A	Torque ¹⁾ > Nm	V	A	Torque ¹⁾ > Nm	Minimum voltage for solenoid switch ²⁾ V
0 001 310 ..	GF 0,55 kW	5,5	65	4500							2,5 2	290...370 220...300	7 5,5	3,5
0 001 311 ..	GF 1 kW	11,5	50	5500	8,5 7,5	350...450 310...400	18 16							7,5
0 001 311 033 043	GF 1,1 kW	11,5	50	5800	7 6	400...490 330...420	14							7,5
0 001 311 042 047 050 056	GF 1,35 kW	11,5	70	7500	7,5 6,5	480...560 410...490	12 10							8,0
0 001 311 1.	GF 1,1 kW	11,5	70	7500	7,4 6,5	480...560 410...490	16 15							8,0
0 001 313 ..	GF 1,5 kW	11,5	80	8000	6 5	520...610 430...520	17 14,8							7,5
0 001 314 ..	GF 1,5 kW	11,5	80	7500	6 5	690...780 560...650	22 19							7,5
0 001 315 ..	GF 1,9 kW	11	85	9000	5,5 5	680...830 610...750								7,5
0 001 316 ..	GF 1,6 kW	23,5	35	7000				18 19	270...340 290...360	24 25				17,5
0 001 317 ..	GF 1,7 kW	11,5	80	7500	5,5 5,0	700...820 650...750	22 20							7,5

1) Only for test benches with torque tester

2) Minimum pull-in voltage for solenoid switch for tooth / tooth connection (meshing travel of pinion max. 2 mm).

A5

Test specifications - electrical

G-starting motors 0 001 30. ..., 0 001 31.



A6

Test specifications - electrical

G-starting motors 0 001 30. ..., 0 001 31.



Test specifications - mechanical

Part number of starting motor	C7		B 13		D1		C6		D4		D6		C18		D12		D13	
	Commutator diameter new mm	min. mm	Carbon brushes minimum length mm	pressure N	True-running error Commutator lam. core mm	mm	mm	mm	mm	mm	mm	mm	Nm	Nm	mm	mm	mm	mm
0 001 304 ..	35,3	33,5	17	9...10,5	0,03	0,05	0,1...0,3	0,3...0,5	0,06...0,1	0,3...0,6	2,0...3,0							
305 ..	35,3	33,5	17	9...10,5	0,03	0,05	0,1...0,3	0,3...0,5	0,14...0,22	0,3...0,6	2,0...3,0							
306 ..	36	33,5	17	9...10,5	0,03	0,05	0,1...0,3	0,3...0,5	0,14...0,22	0,3...0,6	2,0...3,0							
307 ..	36	33,5	17	9...10,5	0,03	0,05	0,1...0,3	0,3...0,5	0,26...0,32	0,3...0,6	2,0...3,0							
307 019	36	33,5	17	13...15	0,03	0,05	0,1...0,3	0,3...0,5	0,26...0,32	0,3...0,6	2,0...3,0							
308 ..	36	33,5	17	9...10,5	0,03	0,05	0,1...0,3	0,3...0,5	0,14...0,22	0,3...0,6	2,0...3,0							
308 1..	36	33,5	17	9...10,5	0,03	0,05	0,05...0,3	0,3...0,5	0,28...0,4	0,3...0,6	2,0...3,0							
312 ..	36	33,5	13	18...21	0,03	0,05	0,1...0,3	0,3...0,55	0,14...0,22	0,3...0,6	2,0...3,0							
312 104 105	36	33,5	13	15...17	0,03	0,05	0,1...0,3	0,3...0,55	0,18...0,28	0,3...0,6	2,0...3,0							

1) overrunning torque uprated as of 4.79

Test specifications - mechanical (continued)

Part number of starting motor	C7		B 13		D1		C6		D4		D6		C18		D12		D13	
	Commutator diameter new mm	min. mm	Carbon brushes minimum length mm	pressure N	True-running error Commutator mm	lam. core mm	Armature longitudinal play mm	Armature braking torque Nm	Overrunning torque Nm	Backlash mm	Pinion clearance mm							
0 001 310 ..	35,3	33,5	17	11,5...13,5	0,03	0,05	0,05...0,3	0,25...0,4	0,14...0,22	0,3...0,6	2,0...3,0							
0 001 311 ..	36	33,5	13	11,5...13,5	0,03	0,05	0,05...0,3	0,25...0,4	0,14...0,22	0,3...0,6	2,0...3,0							
0 001 311 042	36	33,5	13	11,5...13,5	0,03	0,05	0,1 ...0,3	0,3 ...0,55	0,14...0,22	0,3...0,6	2,0...3,0							
0 001 311 1..	36	33,5	13	18...21	0,03	0,05	0,1 ...0,3	0,3 ...0,55	0,14...0,22	0,3...0,6	2,0...3,0							
0 001 313 ..	36	33,5	13	18...21	0,03	0,05	0,05...0,3	0,3 ...0,55	0,14...0,22	0,3...0,6	2,0...3,0							
0 001 314 ..	36	33,5	13	18...21	0,03	0,05	0,05...0,3	0,3...0,55	0,14...0,22 0,22...0,28 ¹⁾	0,3...0,6	2,0...3,0							
0 001 315 ..	36	33,5	13	11,5...13,5	0,03	0,05	0,05...0,3	0,3...0,55	0,14...0,22	0,3...0,6	2,0...3,0							
0 01 316 ..	36	33,5	13	18...21	0,03	0,05	0,05...0,3	0,3...0,55	0,14...0,22	0,3...0,6	2,0...3,0							
0 001 317 ..	35,3	33,5	10		0,03	0,05	0,05...0,3	0,3...0,6	0,18...0,26	0,3...0,6	2,0...3,0							

1) overrunning torque uprated as of 4.79

A9

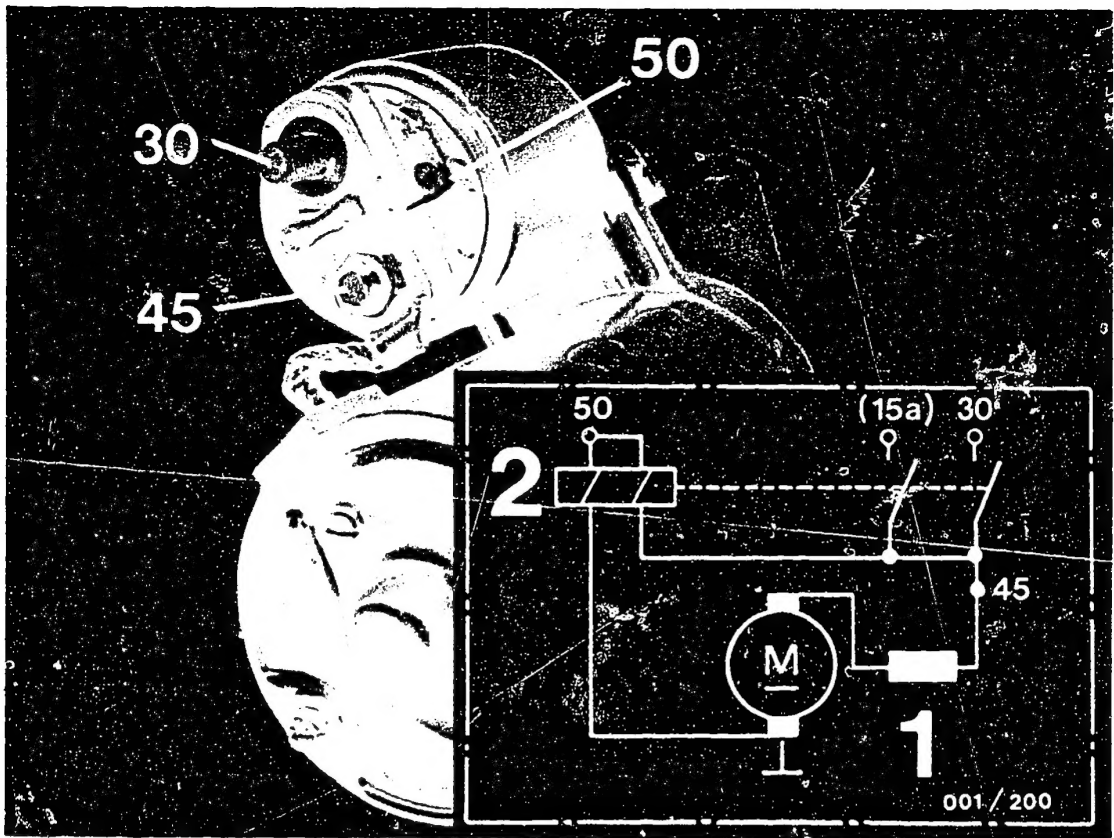
Test specifications - mechanical
G-starting motors 0 001 30. ...,0 001 31.



A10

Test specifications - mechanical
G-starting motors 0 001 30. ...,0 001 31.





1 = Excitation winding

2 = Solenoid switch

4. Connection diagram and circuit diagram

Term. 15 a applicable in some cases.

A11

Circuit diagram, terminal designations

G-starting motors 0 001 30. ..., 0 001 31.



5. General information

- 5.1 In order to guarantee proper operation, use the lubricants specified in these instructions.
- 5.2 Proper repairs are possible only using the specified tools and correctly maintained measuring instruments. We therefore advise you to use only the stated tools.
- 5.3 The sintered bushings in the drive-end-bearing housing, intermediate bearing, commutator end shield and pinion must always be renewed whenever repairs are carried out.
- 5.6 Ensure utmost cleanliness when performing repair work.

A12

General information

G-starting motors 0 001 30. ..., 0 001 31.



5.7 Cleaning the parts

Armature, excitation windings, overrunning-clutch drive and relay are to be cleaned only with compressed air (max. 4 bar) and a clean cloth. Do not use any liquid cleaning agent.

Other parts, such as screws, intermediate bearing, drive-end-bearing housing and commutator end shield, may be washed out in low-inflammability, commercially available cleaning agent.

Do not breathe in vapors.

Caution:

After washing out, dry parts thoroughly since otherwise gases may later form in the starting motor when sealed - danger of explosion.

Observe the following safety regulations:

Decree on Working with Combustible Liquids (Vbf) issued by the Federal Ministry of Labor (BmA).

Safety rules for handling chlorinated hydrocarbons:

for the workshop: ZH 1 / 222
for the employee: ZH 1 / 119

issued by the Central Association of German Employers' Liability Insurance Associations (Central Association for Accident Prevention and Industrial Medicine), Langwartweg 103, 5300 Bonn 5.

In countries outside the Federal Republic of Germany, observe the corresponding local regulations.

A13

General information

G-starting motors 0 001 30. ..., 0 001 31.



6. Necessary test equipment and tools

Test panel	KDAW 9984
Transformer panel	KDAW 9985
Interturn-short-circuit tester	(EFAW 90) 0 681 103 500
or	(EFAW 95) 0 681 103 200
Electrics tester	ETE 014.00 0 684 101 400
or	
Multimeter	commercially available
Torque wrench	commercially available
Arbor press	commercially available
Mounting sleeve (for 12 mm dia.)	KDAL 5028
Clamping support with pole shoe screwdriver	KDAW 9999
Notch device	KDAL 5487
Measuring mandrel 12, 15 mm	KDAL 5024
Tailstock steadies for mounting armature when turning down the commutator	
with Morse cone 2	KDAW 9987
with Morse cone 3	KDAW 9990
Undercutting saw	KDAW 9998
Driving-in mandrel for pole shoes	user-fabrication D=66.1 -0.01 mm -0.06 L=85 mm



Necessary tools (continued)

Torquemeter 0.04 ... 0.12 Nm KDAL 5482
0.15 ... 0.8 Nm KDAL 5485

Spring scale 2 ... 12 Nm KDAW 9991
5 ... 20 Nm KDAW 9993
15 ... 50 Nm KDAW 9992

Puller

Base part KDAL 5493

Spring collet 12.0...12.5 mm dia. KDAL 5493/0/3

Calking tool KDAL 5488
KDAL 5488/0/2
KDAL 5488/0/3



7. Lubricants

Special lubricating grease

for shafts

500 g can (VS 10832 Ft) 5 932 240 150

Lubricating oil

0.50 l can (VS 13834 01) 5 962 260 605

Silicone grease

High-grade lubricating grease with
high-pressure additives (FT 2 v 3)

250 g tube 5 700 082 025

50 g tube 5 700 082 005

Sealing putty

500 g can (Kk 1 v 3) 5 703 452 150

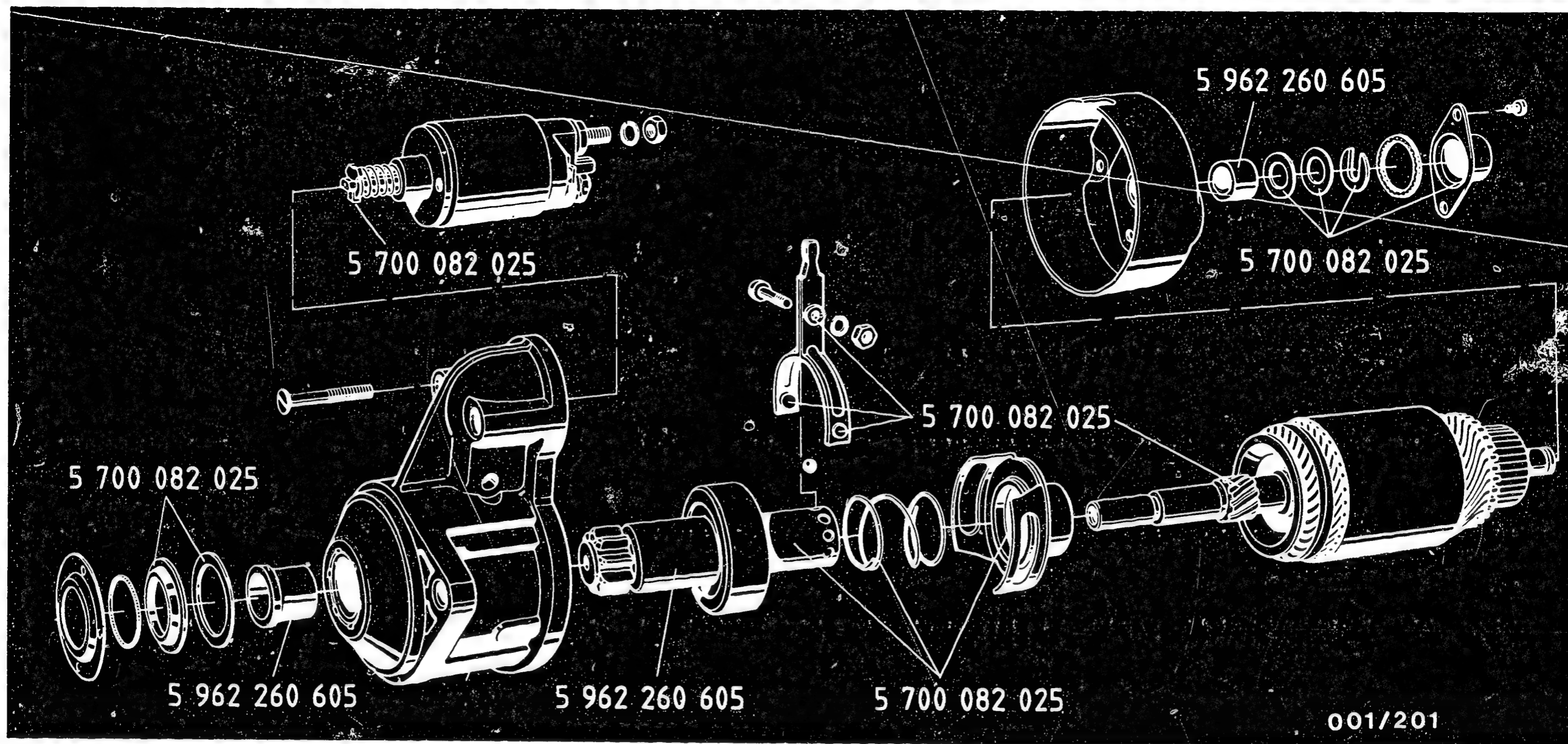
20 g tube (V9844 Kk) 5 927 350 002

A16

Lubricants

G-starting motors 0 001 30. ..,0 001 31.





5 700 082 025 = Silicone grease (Ft 2 v 3)
 5 962 260 605 = Lubricating oil (VS 13834 01)

Lubrication table for starting motor 0 001 312 1..

Be sure to keep commutator free of grease and oil.

The stated components should be greased or oiled sparingly. Too much grease causes malfunctions at low temperatures. All other bright parts should be lightly oiled with anti-corrosion oil.

Note:

Holding washers and shims or closure cap should be lightly greased on the inside with 5 700 082 025 (approx. 0.2 g), but only after setting the armature longitudinal play.

A17

Lubrication table

G-starting motors 0 001 30. ...,0 001 31.

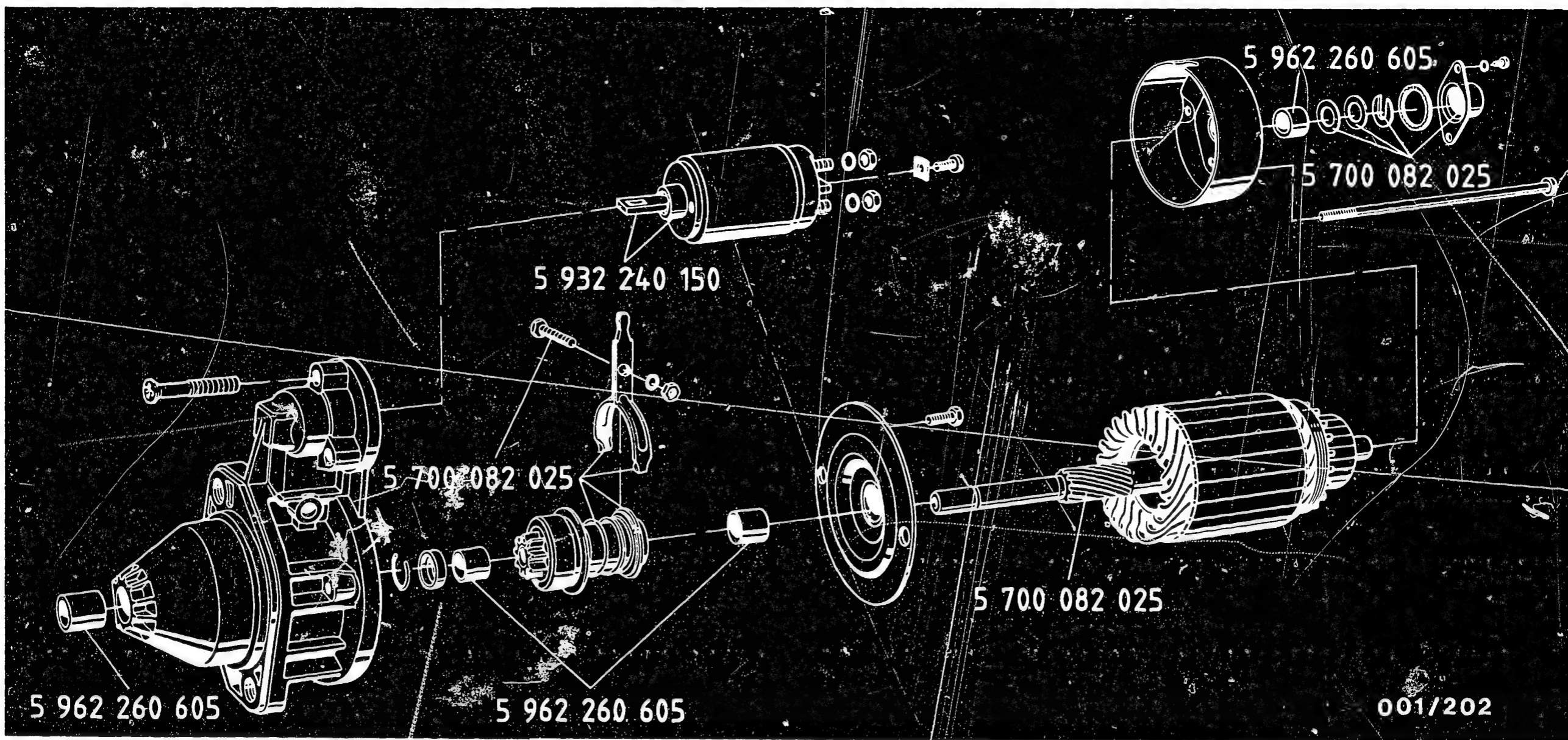


A18

Lubrication table

G-starting motors 0 001 30. ...,0 001 31.





- 5 700 082 025 = Silicone grease (Ft 2 v 3)
- 5 932 240 150 = Special lubricating grease (VS 10832 Ft)
- 5 962 260 605 = Lubricating oil (VS 13834 01)

Lubrication table for starting motor 0 001 30. ..., .. 314 ..., .. 315 ..., .. 316 ..

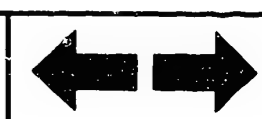
Be sure to keep commutator free of grease and oil.
 The stated components should be greased or oiled sparingly. Too much grease causes malfunctions at low temperatures. All other bright parts should be lightly oiled with anti-corrosion oil.

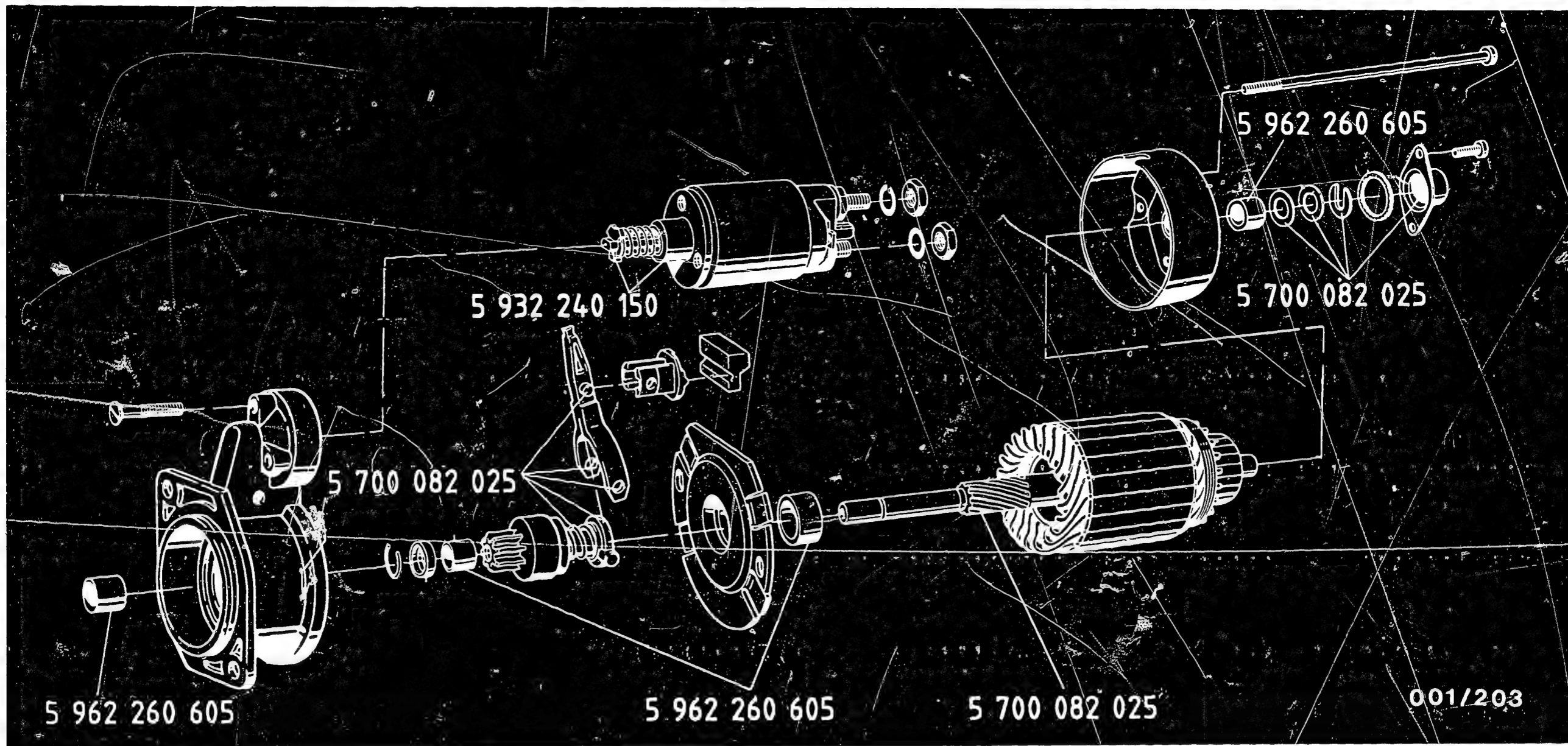
Note:
 Holding washers and shims or closure cap should be lightly greased on the inside with 5 700 082 025 (approx. 0.2 g), but only after setting the armature longitudinal play.

A19	Lubrication table
	G-starting motors 0 001 30. ..., 0 001 31.



A20	Lubrication table
	G-starting motors 0 001 30. ..., 0 001 31.





- 5 700 082 025 = Silicone grease (Ft 2 v 3)
- 5 932 240 150 = Special lubricating grease (VS 10832 Ft)
- 5 962 260 605 = Lubricating oil (VS 13834 01)

Lubrication table for starting motor 0 001 310 317 ..

Be sure to keep commutator free of grease and oil.

The stated components should be greased or oiled sparingly. Too much grease causes malfunctions at low temperatures. All other bright parts should be lightly oiled with anti-corrosion oil.

Note:

Holding washers and shims or closure cap should be lightly greased on the inside with 5 700 082 025 (approx. 0.2 g), but only after setting the armature longitudinal play.

A21

Lubrication table

G-starting motors 0 001 30. ..., 0 001 31.

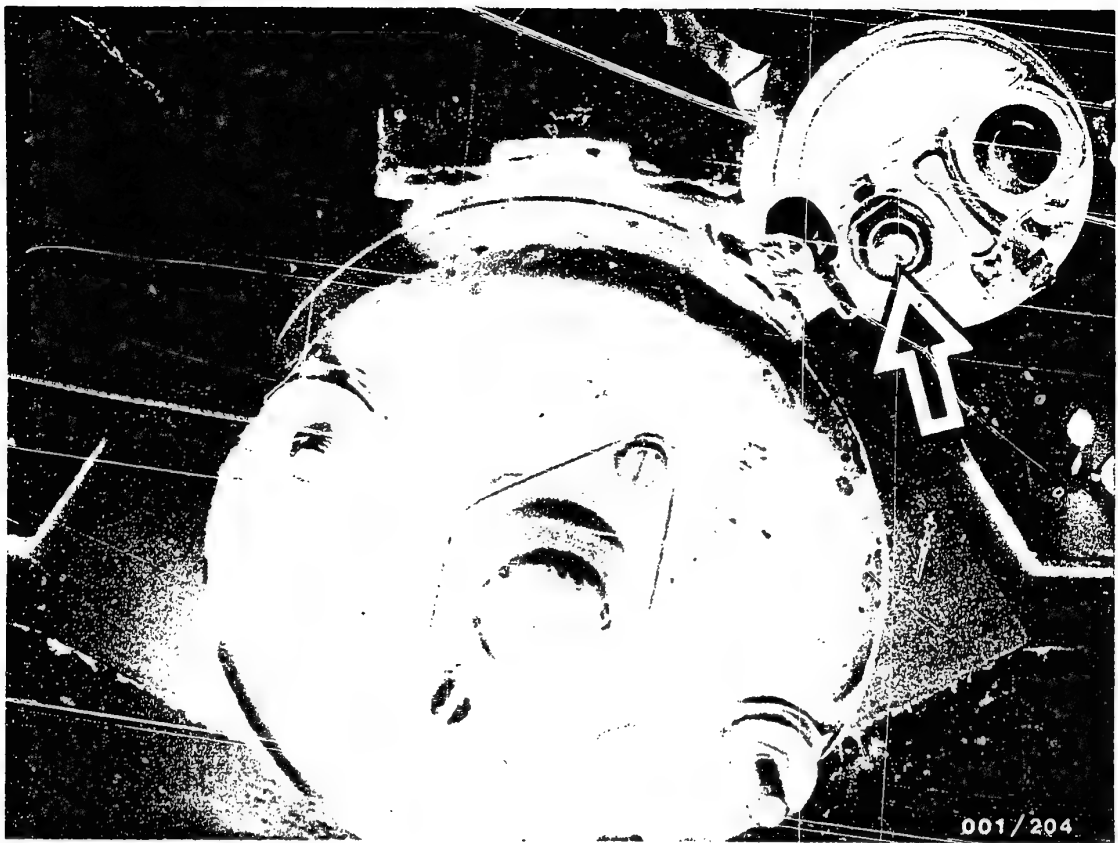


A22

Lubrication table

G-starting motors 0 001 30. ..., 0 001 31.





8. Dismantling the starting motor

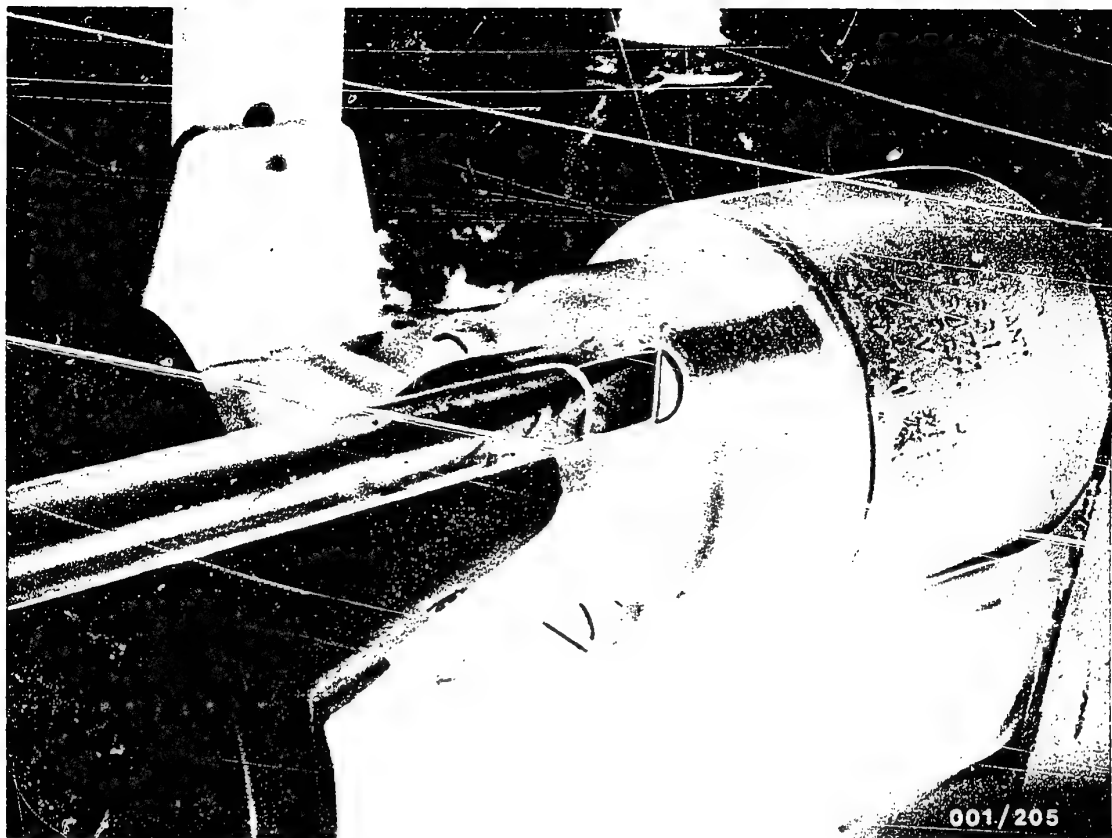
Clamp the starting motor in clamping support KDAW 9999. Unscrew terminal 45 on solenoid switch (see picture, arrow).

B1

Dismantling the starting motor

G-starting motors 0 001 30. ..,0 001 31.





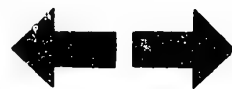
8.1 Removing the solenoid switch

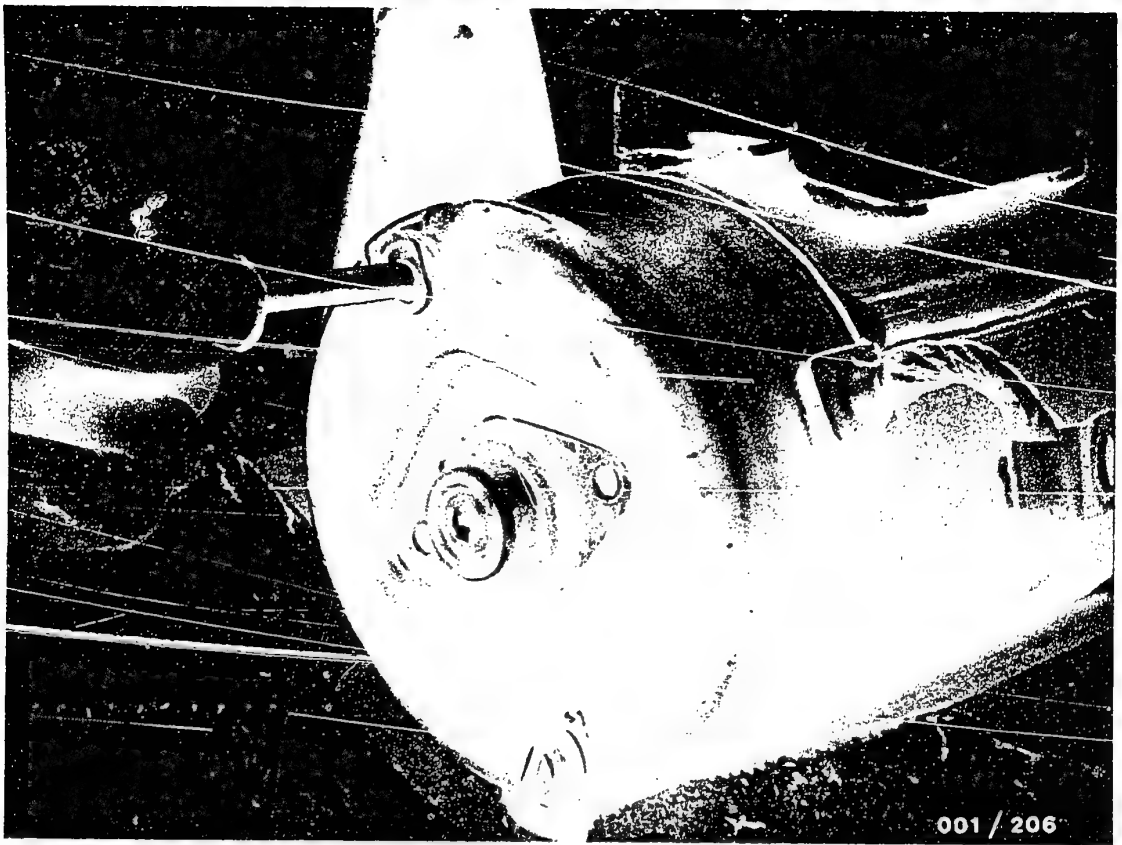
Loosen 3 fastening screws of solenoid switch (see picture) and remove solenoid switch with armature and return spring.

B2

Dismantling the starting motor

G-starting motors 0 001 30. ..., 0 001 31.





8.2 Removing the stator frame

Unscrew screws of rear closure cap and take off closure cap.

Remove holding washers and shims from armature shaft (already removed in picture).

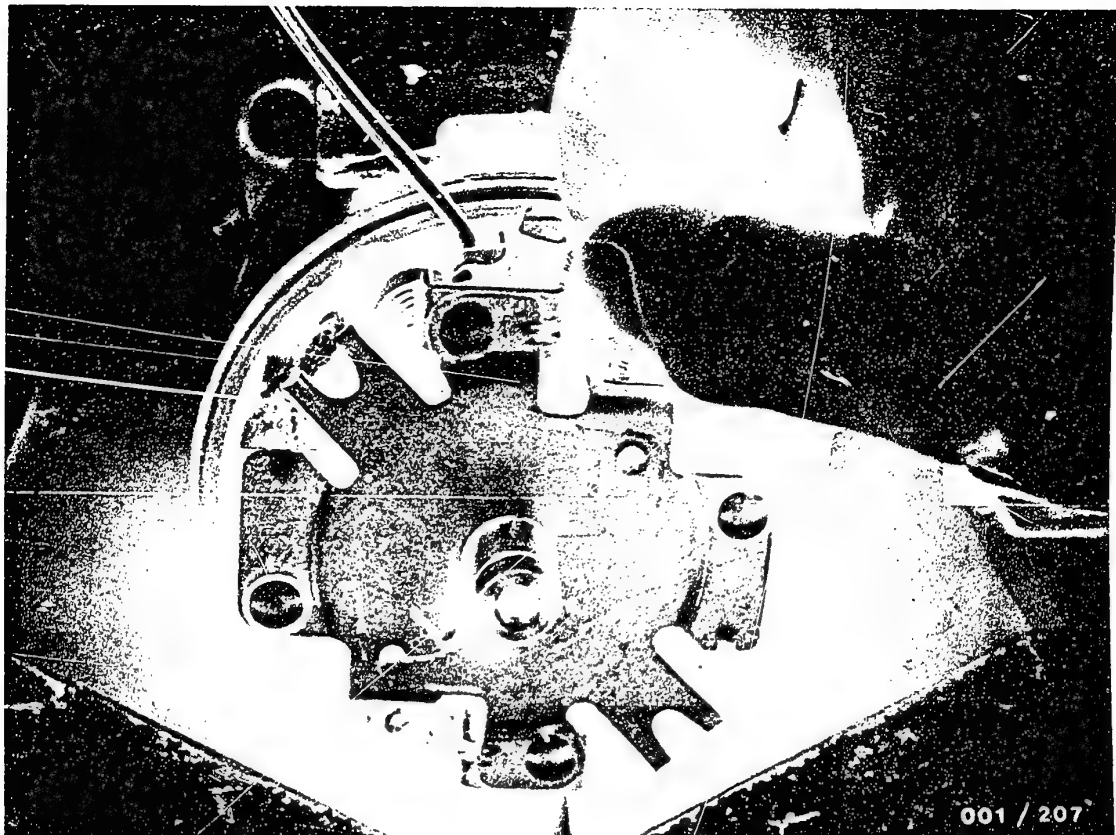
Unscrew through-bolts and take off commutator end shield.

B3

Dismantling the starting motor

G-starting motors 0 001 30. ... 0 001 31.





8.3 Removing the brush holder plate and stator frame

Starting motor with metal brush holder plate (0 001 304 .. to .. 308 .., 0 001 310 .. to .. 316 ..)

Using a suitable tool, lift off spiral spring from carbon brushes (see picture) and remove carbon brushes from brush holder.

Take off brush holder plate.

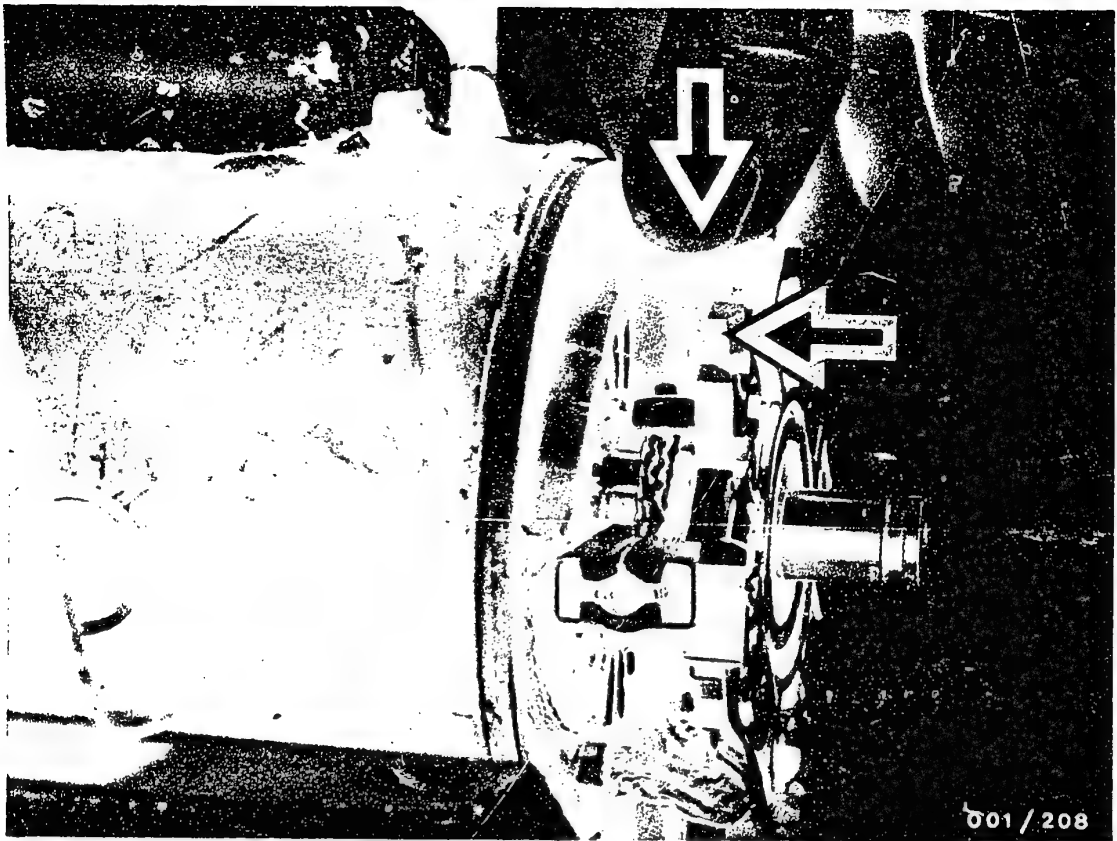
Remove stator frame with excitation winding and pole shoes.

B4

Dismantling the starting motor

G-starting motors 0 001 30. ..., 0 001 31.





001/208

8.3.1 Removing the brush holder plate and stator frame

Starting motor with plastic brush holder plate
(0 001 317 ..).

Press pocket-type brush holder inward against commutator and at the same time release from holding lug in direction of drive-end-bearing housing (see picture, arrows). Remove armature with drive-end-bearing housing from stator frame.

B5

Dismantling the starting motor

G-starting motors 0 001 30. .., 0 001 31.



8.4 Removing the armature shaft with pinion, overrunning clutch and intermediate bearing

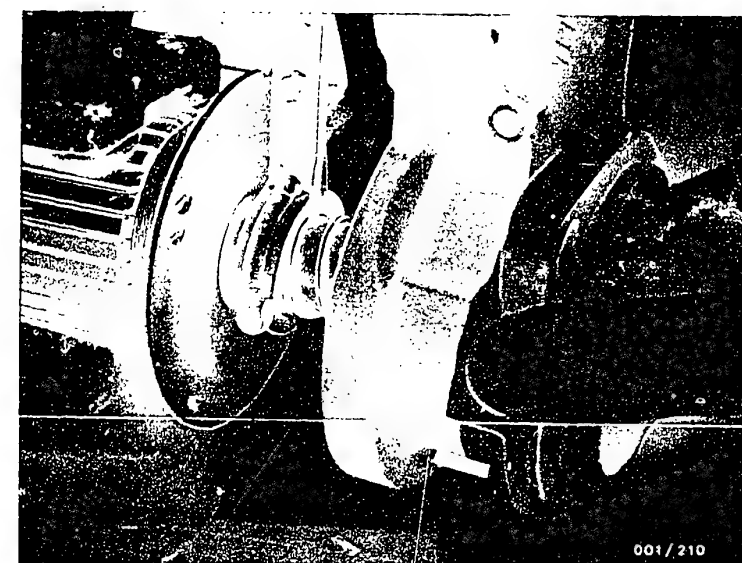
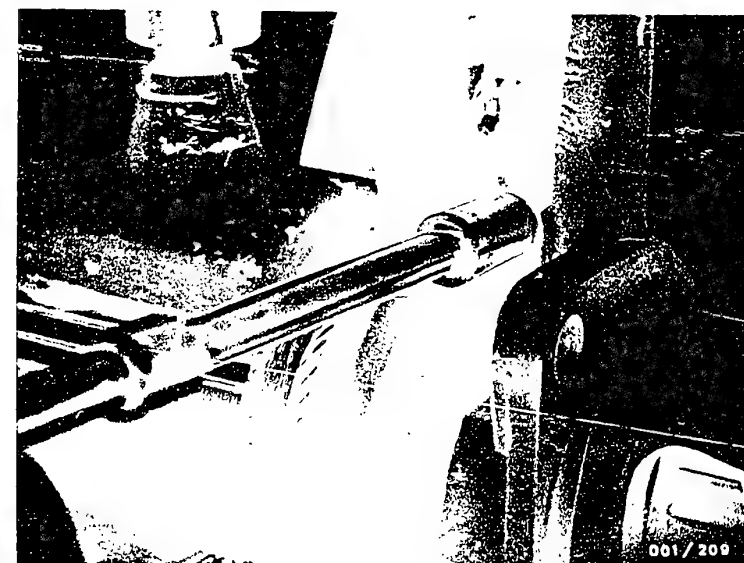
Starting motor 0 001 304 .. to .. 308 .., 0 001 310 .. to .. 316 ..

Unscrew bearing screw for fork lever (see top picture).

Remove sealing rubber and gasket.

Unscrew screws for intermediate bearing.

Remove armature shaft with pinion, overrunning clutch and intermediate bearing from drive-end-bearing housing (see bottom picture).



B6

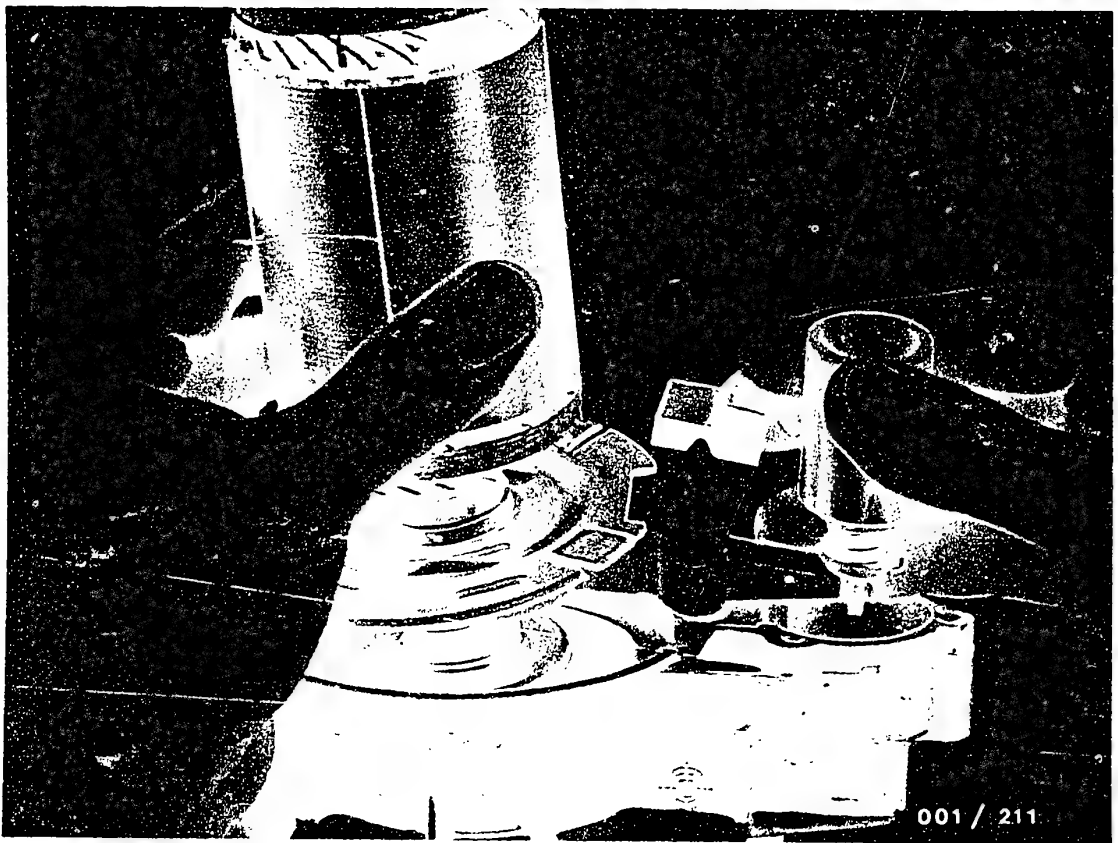
Dismantling the starting motor
G-starting motors 0 001 30. ..., 0 001 31.



B7

Dismantling the starting motor
G-starting motors 0 001 30. ..., 0 001 31.





8.4.1 Removing the armature shaft with pinion, over-
running clutch and intermediate bearing, starting motor
0 001 317 ..

Take out rubber seal.

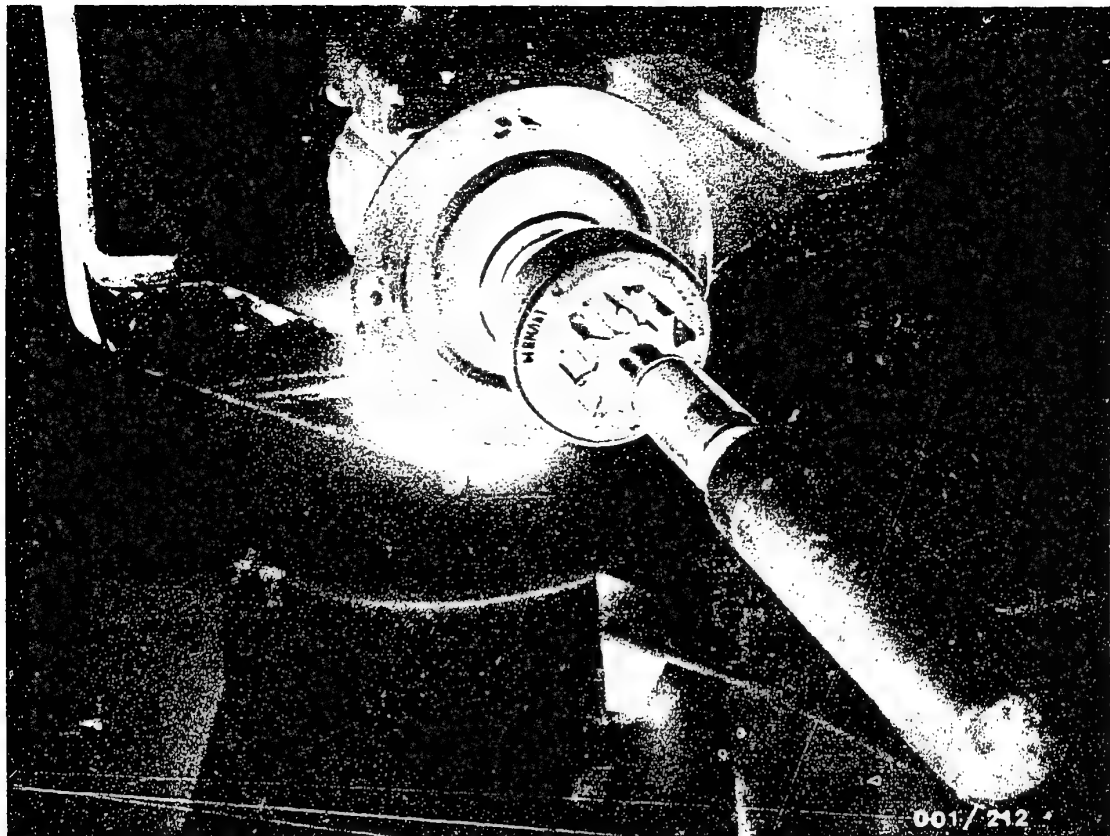
Remove armature shaft with pinion, overrunning clutch,
intermediate bearing, fork lever and relay armature from
drive-end-bearing housing (see picture).

Release relay armature from fork lever.

B8

Dismantling the starting motor
G-starting motors 0 001 30. ..., 0 001 31.





8.5 Removing the armature shaft

Clamp armature in clamping support KDAW 9999. Using striking sleeve KDAL 5028 and rubber hammer, knock back stop ring (see picture).

Using suitable pliers, bend apart the ends of the retainer.

When removing the retainer, prevent any damage to the armature shaft.

Carefully remove any burr on the groove of the armature shaft using a file (otherwise damage to the bearing sleeve).

B9

Dismantling the starting motor

G-starting motors 0 001 30. ..., 0 001 31.



9. Cleaning the parts

Armature, excitation windings, overrunning-clutch drive and relay are to be cleaned only with compressed air (max. 4 bar) and a clean cloth. Do not use any liquid cleaning agent.

Other parts, such as screws, intermediate bearing, drive-end-bearing housing and commutator end shield, may be washed out in low-inflammability, commercially available cleaning agent.

Do not breathe in vapors.

Caution:

After washing out, dry parts thoroughly since otherwise gases may later form in the starting motor when sealed - danger of explosion.

Observe the following safety regulations:

Decree on Working with Combustible Liquids (Vbf) issued by the Federal Ministry of Labor (BmA).

Safety rules for handling chlorinated hydrocarbons:

for the workshop: ZH 1 / 222

for the employee: ZH 1 / 119

issued by the Central Association of German Employers' Liability Insurance Associations (Central Association for Accident Prevention and Industrial Medicine),
Langwartweg 103, 5300 Bonn 5.

In countries outside the Federal Republic of Germany, observe the corresponding local regulations.



Working with inflammable or health-hazardous substances

Benzine, tri or perchloroethylene are approved for washing out automotive electric components which are to be repaired.

Handle both cleaning agents carefully in accordance with their degree of danger.

Benzine, acetone and ethanol are combustible liquids and, when mixed with air, are explosive. Washing out may be performed only in special bowls or containers having a special protective lid which automatically closes should the liquid ignite, thereby smothering the fire. An extractor system must be provided in the case of larger washing-out containers (as of 500 x 500 mm).

In the case of starting motors, after the components have been washed, particularly in the case of windings washed in benzine, the components must be dried thoroughly.

B11

Cleaning the parts - safety regulations

G-starting motors 0 001 30. ..,0 001 31.



Tri or perchloroethylene are liquids whose vapors have a narcotic effect and are hazardous to health if inhaled over long periods.

The vapors of trichloroethylene are heavier than air and, therefore, there is increased danger near floor level.

Wear protective goggles and gloves when washing out.

Cleaning operations with trichloroethylene at regular intervals or continuously may be performed only in specially provided containers with an extractor system on.

When washing out, avoid bending over the trichloroethylene container.

B 12

Cleaning the parts - safety regulations

G-starting motors 0 001 30. ..,0 001 31.



10. Examination and repair

10.1 General

Check all parts for wear and damage. Worn parts must be replaced.

Lubricate starting motor in accordance with lubrication table before and during assembly.

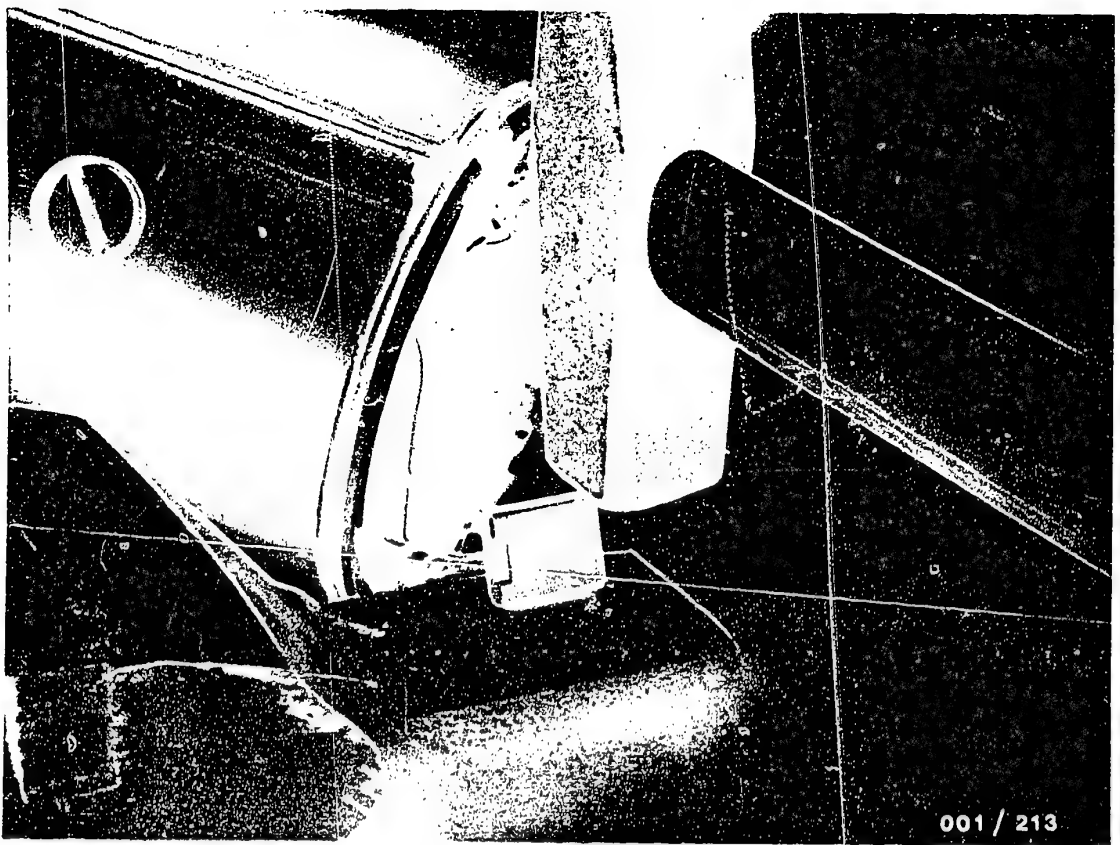
Where necessary, lubrication points and lubricants are indicated in the text.

In addition, complete lubrication tables are provided on Coordinates A 16 to A 21.

10.2 Minimum length of carbon brushes

Starting motor:	0 001 304 ..,	
	0 001 305 ..,	
	0 001 306 ..,	17 mm
	0 001 307 ..,	
	0 001 308 ..,	
	0 001 310 ..,	
	0 001 311 ..,	
	0 001 312 ..,	
	0 001 313 ..,	13 mm
	0 001 314 ..,	
	0 001 316 ..,	
	0 001 317 ..	10 mm





10.2.1 Replacing the carbon brushes -

Starting motor: 0 001 304 ..,
0 001 305 ..,
0 001 306 ..,
0 001 307 ..,
0 001 308 ..,
0 001 310 ..,

0 001 311 ..,
0 001 312 ..,
0 001 313 ..,
0 001 314 ..,
0 001 316 ..

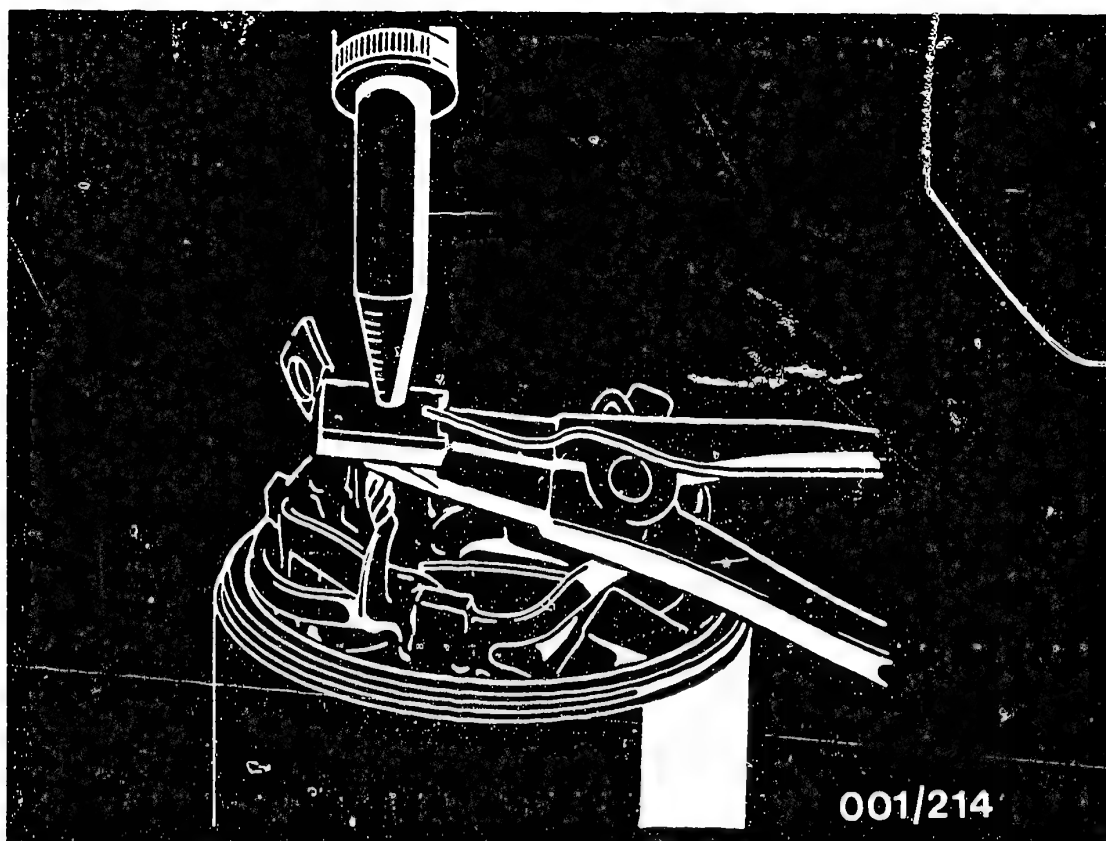
Old carbon brushes should be knocked or squashed to pieces (see picture).

B14

Examination and repair

G-starting motors 0 001 30. ..,0 001 31.





Scrape end of wire so that it is bright, stick through the hole of the replacement carbon brush and spread open on the other side of the brush and solder (see picture). Hold wire directly behind the carbon brush with pliers.

Use soldering iron with 250 - 350 W and paste-type soldering flux. After soldering, be sure to wash off soldering paste with ethanol or trichloroethylene. Use a file to remove any projecting solder. Check carbon brush for freedom of movement in brush holder.

Note:

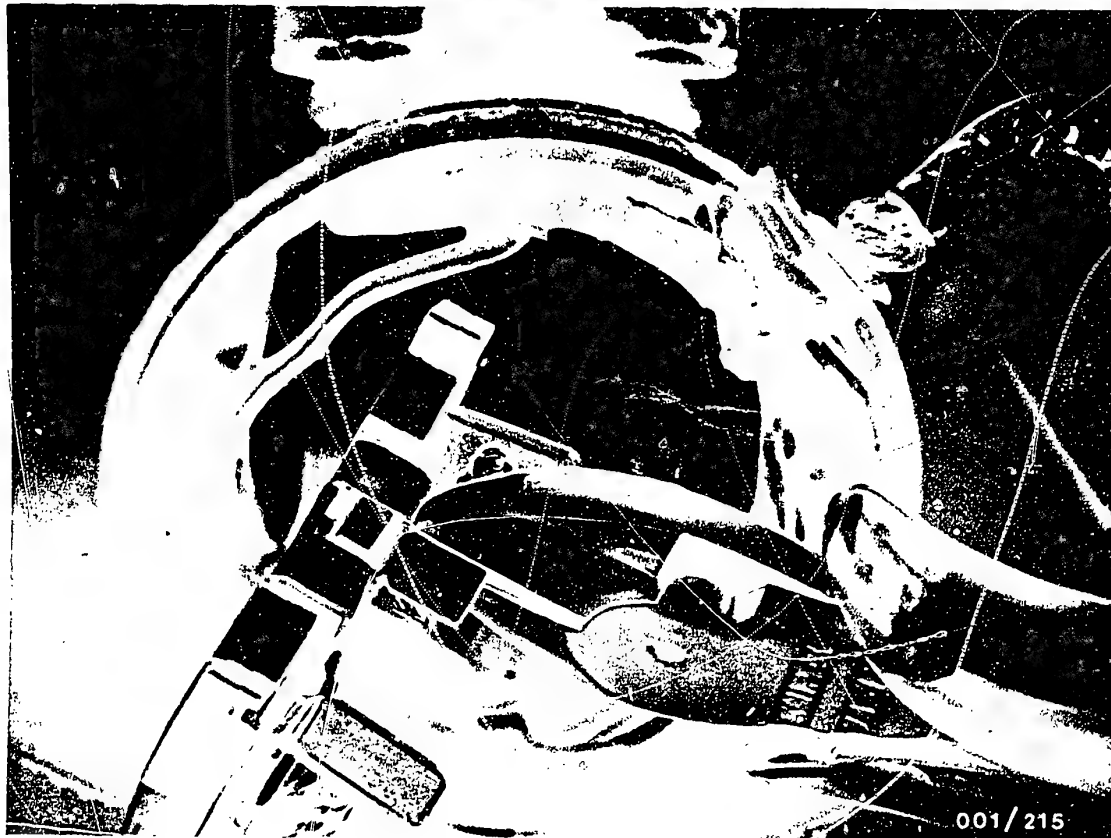
If damaged, rusty or burnt out, replace compression springs.

B 15

Examination and repair

G-starting motors 0 001 30. ..,0 001 31.





10.2.2 Replacing the carbon brushes

Starting motor: 0 001 317 ..

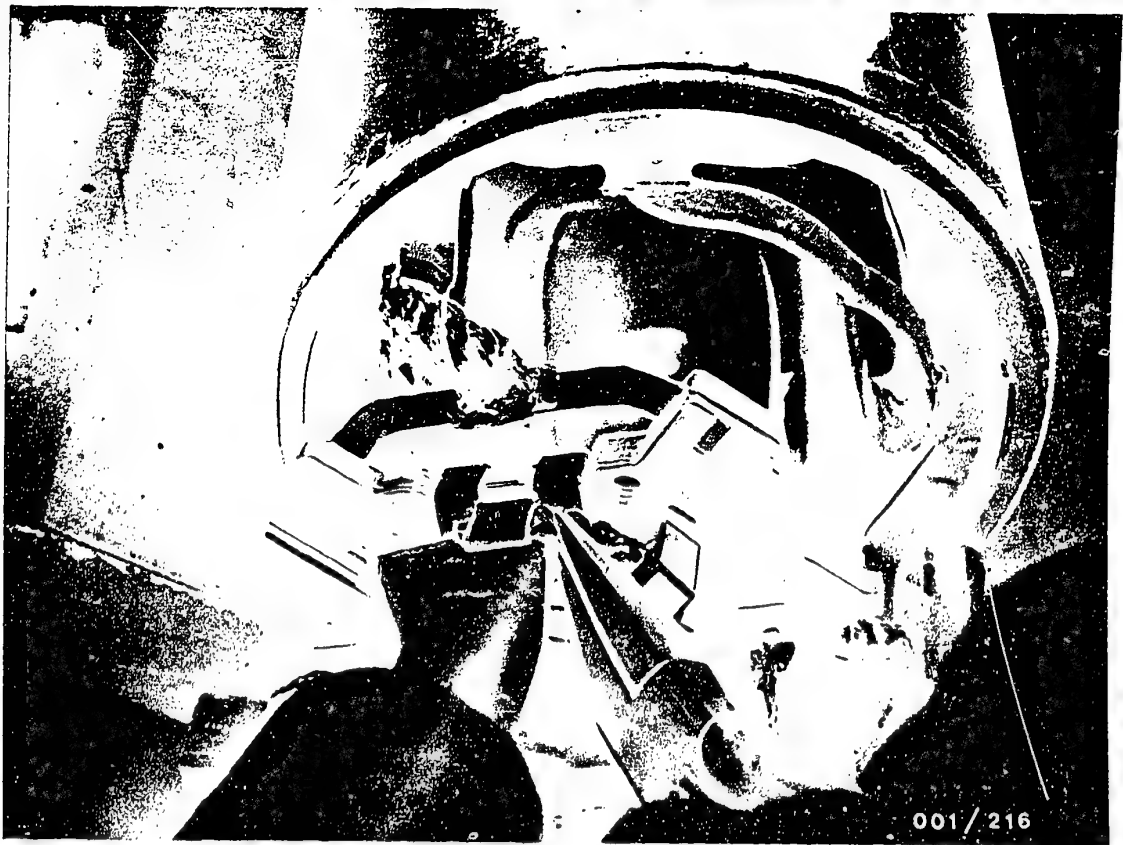
Using side cutters, cut wires of carbon brushes from the bus bar at the ends (see picture).

B 16

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.





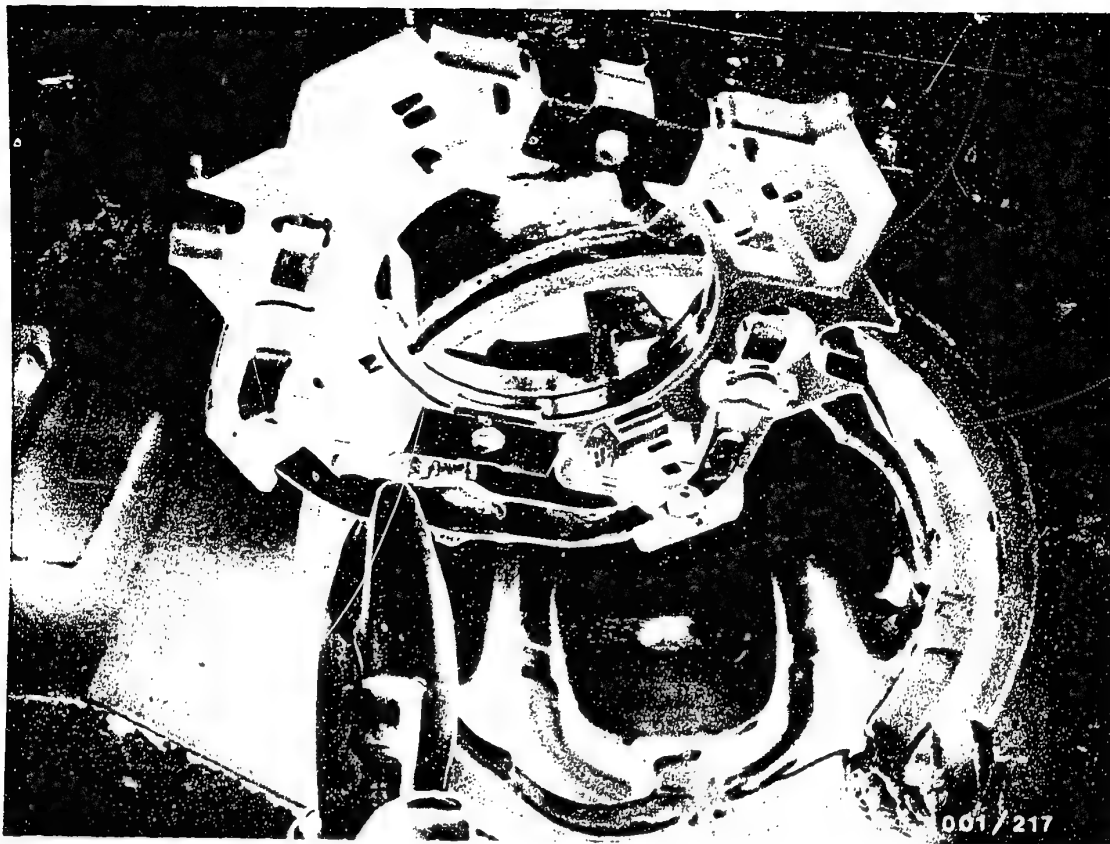
Using 250 - 350 W soldering iron, solder the wire of the new carbon brush onto the remaining piece of the old wire (see picture).

B 17

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.





10.3 Replacing the brush holder plate

Starting motor 0 001 317 ..

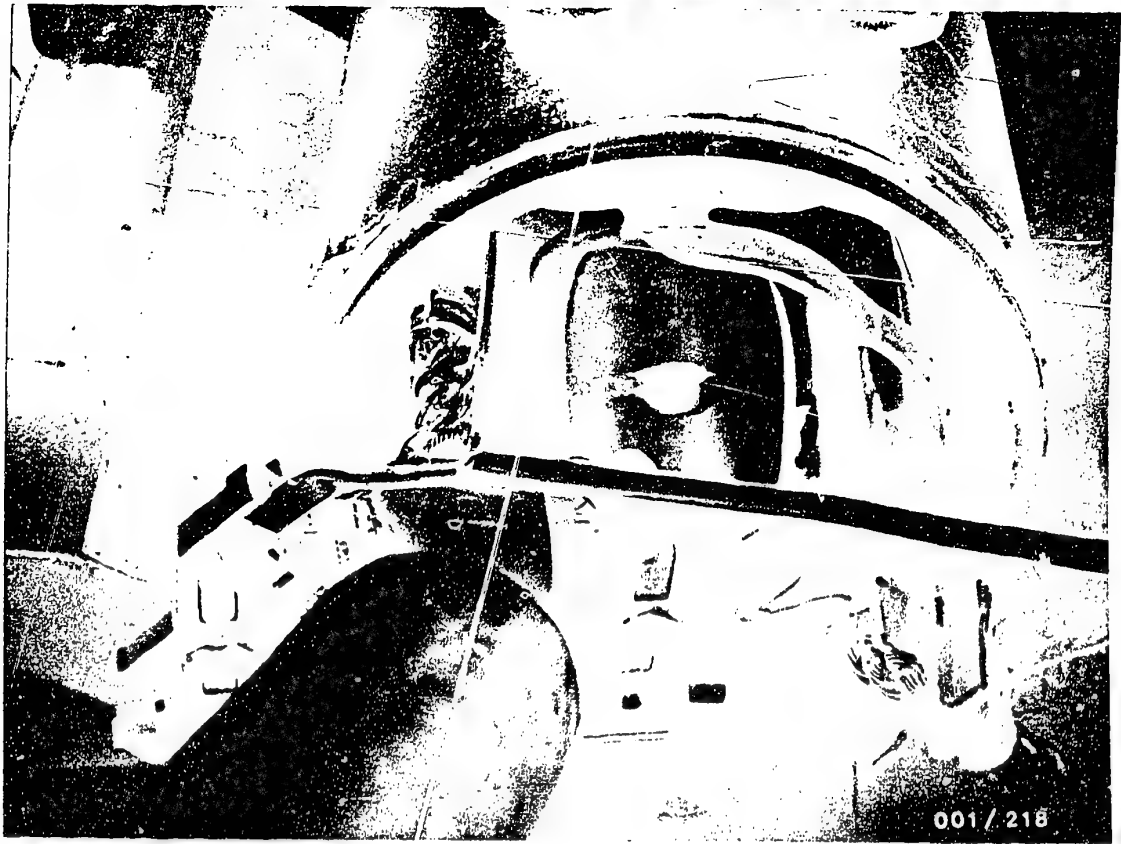
Using side cutters, cut through the bus bar to left and right of the wire of the excitation winding (see picture).

B 18

Examination and repair

G-starting motors 0 001 30. .., 0 001 31.





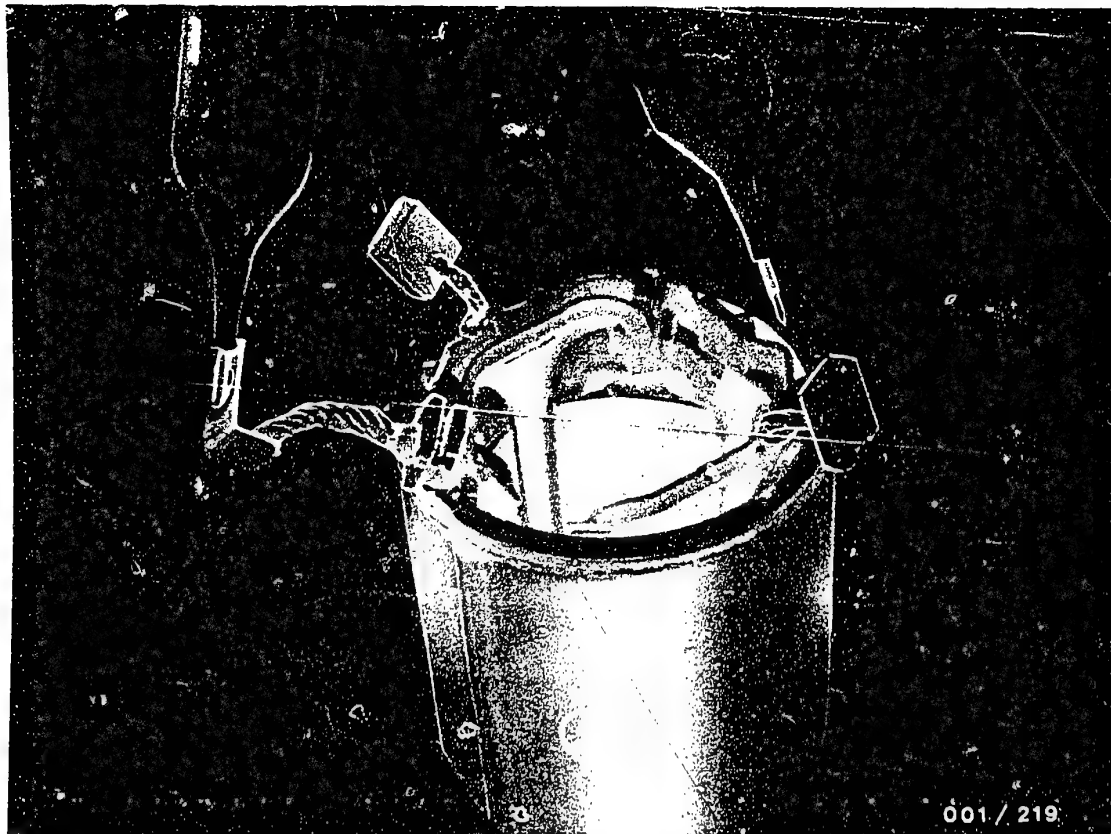
Solder wire of excitation winding to bus bar of the new brush holder plate (see picture).
Use 250 - 350 W soldering iron.

B19

Examination and repair

G-starting motors 0 001 30. .., 0 001 31.





10.4 Checking the stator frame with excitation winding

Using tester KDAW 9984 and KDAW 9985, check excitation winding for open circuit.

Test voltage: 6 V d.c.

Check for short circuit to ground (see picture)

Test voltage: 80 V for 24 V starting motors

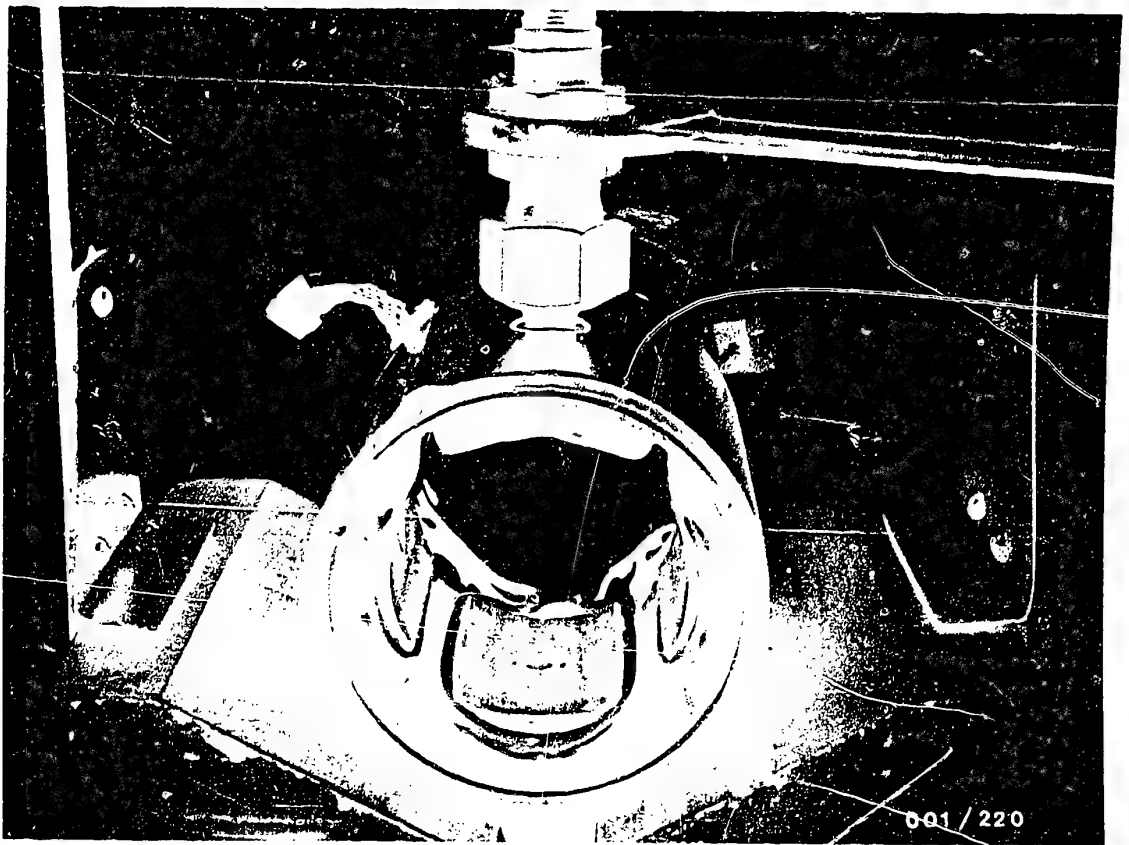
40 V for 12 V starting motors

B20

Examination and repair

G-starting motors 0 001 30. ..,0 001 31.





10.5 Removing the excitation winding

Starting motors 0 001 304 .., 0 001 305 .., 0 001 306 ..
0 001 307 .., 0 001 308 .., 0 001 310 .., 0 001 311 ..,
0 001 312 .., 0 001 313 .., 0 001 314 .., 0 001 315 ..,
0 001 316 ..

Mark the position of the pole shoes.

Place pole shoes in clamping support.

Loosen pole shoe screws with pole-shoe screwdriver KDAW 9999 (see picture).

Take out excitation windings together with pole shoes.

B21

Examination and repair

G-starting motors 0 001 30. .., 0 001 31.



10.5.1 Removing the excitation winding, starting motor 0 001 317 ..

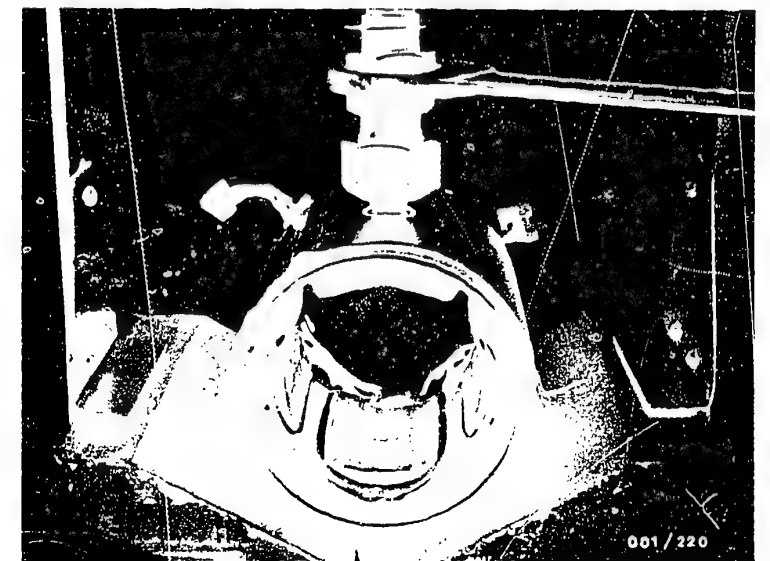
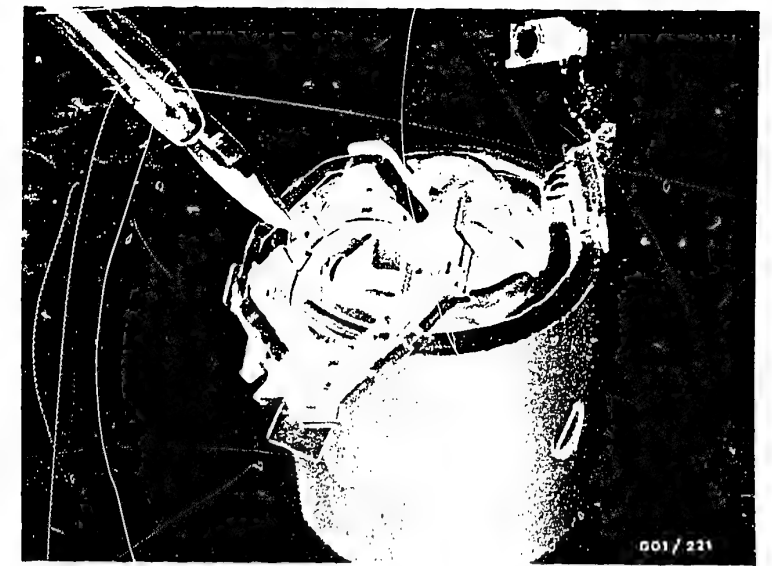
Using side cutters, cut through bus bar to left and right of the wire of the excitation winding (see picture) and remove brush holder plate.

Mark the position of the pole shoes.

Place stator frame in clamping support (KDAW 9999).

Loosen pole shoe screws with pole-shoe screwdriver KDAW 9999.

Take out excitation winding together with pole shoes.



B22

Examination and repair

G-starting motors 0 001 30. ...,0 001 31.



B23

Examination and repair

G-starting motors 0 001 30. ...,0 001 31.



10.6 Installing the excitation winding

Starting motors 0 001 304 .., 0 001 305 .., 0 001 306 .., 0 001 307 ..,
0 001 308 .., 0 001 310 .., 0 001 311 .., 0 001 313 .., 0 001 314 ..,
0 001 315 .., 0 001 316 ..

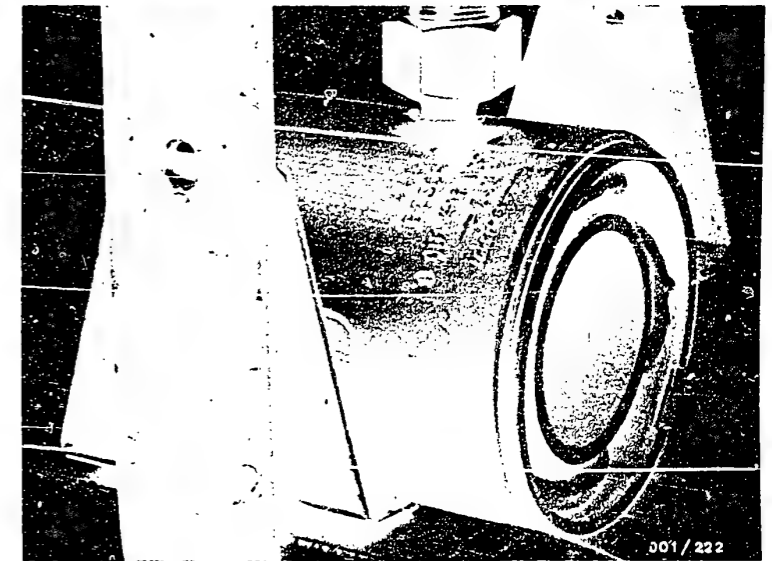
Slightly heat excitation winding (e.g. in heating oven) and introduce into stator frame with pole shoes (pay attention to marking) and screw on finger-tight. Press in suitable drive-in mandrel with arbor press.

($D = 66.1 \begin{matrix} -0.01 \\ -0.06 \end{matrix}$ mm; $L = 85$ mm).

Place stator frame in clamping support and tighten pole screws with pole-shoe screwdriver KDAW 9999.

Tightening torque: 38 ... 50 Nm

Press out drive-in mandrel with arbor press.
Check installed winding for short circuit to ground and open circuit.



C1

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.



C2

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.



10.6.1 Installing the excitation winding, starting motor 0 001 317 ..

Slightly heat the excitation winding (e.g. in heating oven). Introduce into stator frame with pole shoes (pay attention to marking) and screw on finger-tight. Press in suitable drive-in mandrel with arbor press.

(D = $66.1 \begin{smallmatrix} 0.01 \\ 0.06 \end{smallmatrix}$ mm; L = 85 mm).

Place stator frame in clamping support and tighten pole screws with pole-shoe screwdriver KDAW 9999 (see top picture).

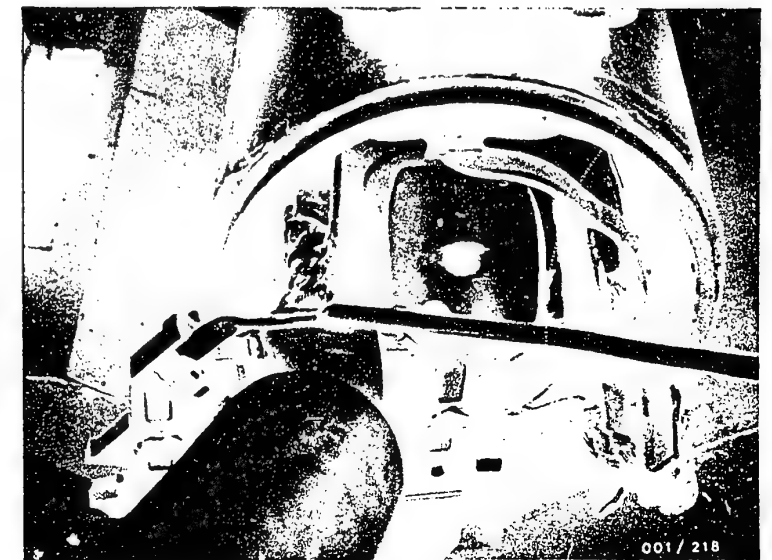
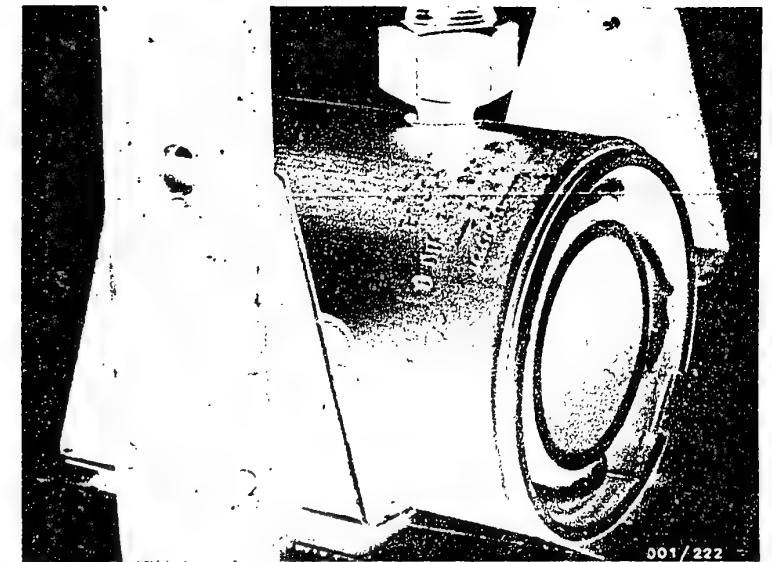
Tightening torque: 38 ... 50 Nm.

Press out drive-in mandrel with arbor press.

Solder wire of excitation winding to bus bar of brush holder plate (see bottom picture).

Use 250 - 350 W soldering iron.

Check installed winding for short circuit to ground and open circuit.



C3

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.

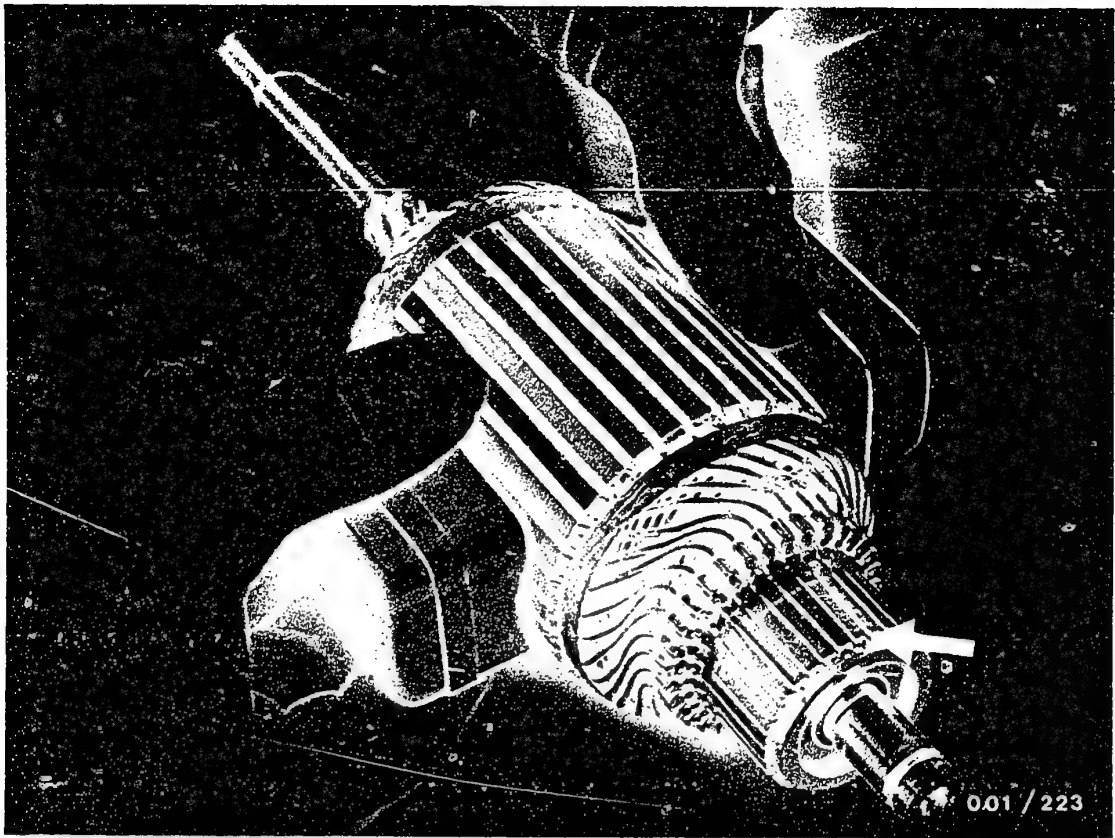


C4

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.





10.7 Checking and repairing the armature

Check the armature for interturn short circuit using tester EFAW 90 or EFAW 95 (see picture).

Check for short circuit to ground with tester EFAW 81 and EFAW 82.

Test voltage: 40 V for 12 V starting motors
80 V for 24 V starting motors

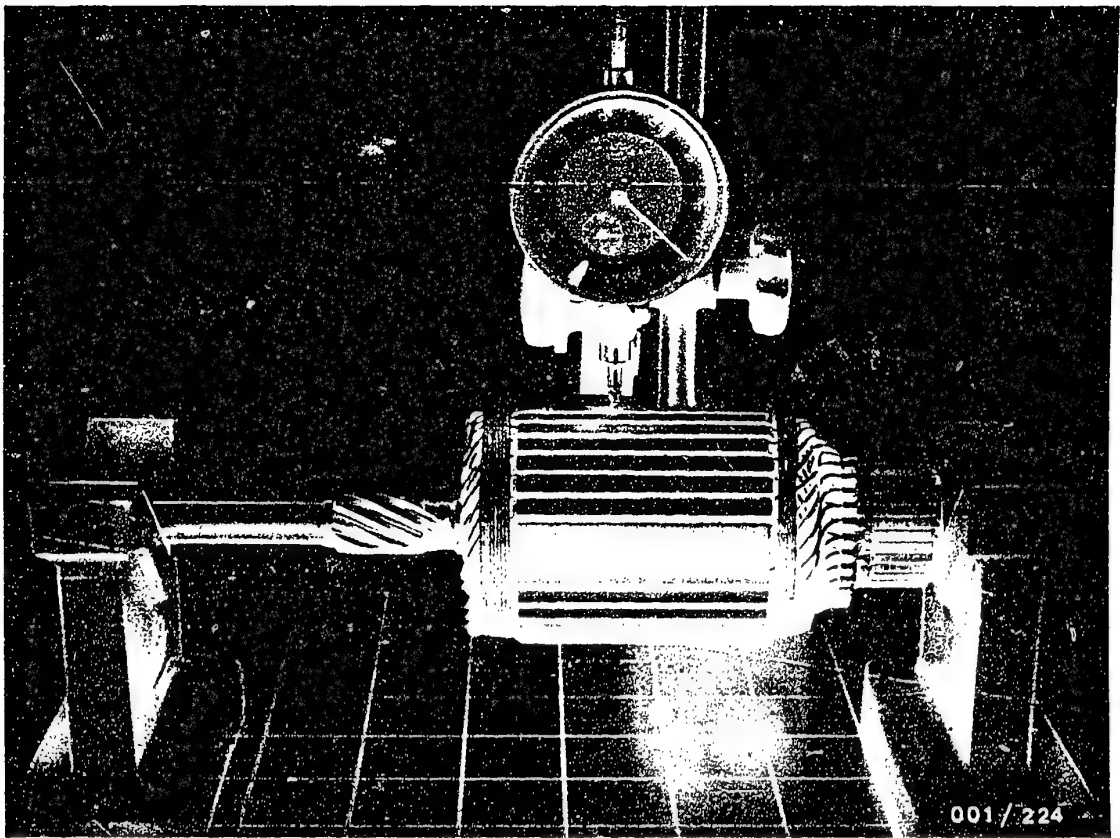
Watch for a possible open circuit (individual laminations are black - see picture, arrow).

C5

Examination and repair

G-starting motors 0 001 30. ...,0 001 31.





Checking the true-running error of the armature

Commutator ≤ 0.03 mm

Laminated core ≤ 0.05 mm

C6

Examination and repair

G-starting motors 0 001 30. ... 0 001 31.



Turning down and undercutting the commutator

If worn spots are visible on the armature, the commutator should be turned down.

Heavily burnt spots indicate an open circuit - replace armature.

Clamp armature by the commutator end and the drive-end-bearing housing end. Do not damage the armature shaft.

Note:

Do not clamp the armature shaft in the middle for turning down. (Middle is used in production only for pre-machining the armature shaft).

Preturning:

We recommend for this the use of a carbide tool.
Turn down the commutator until worn spots are no longer visible.

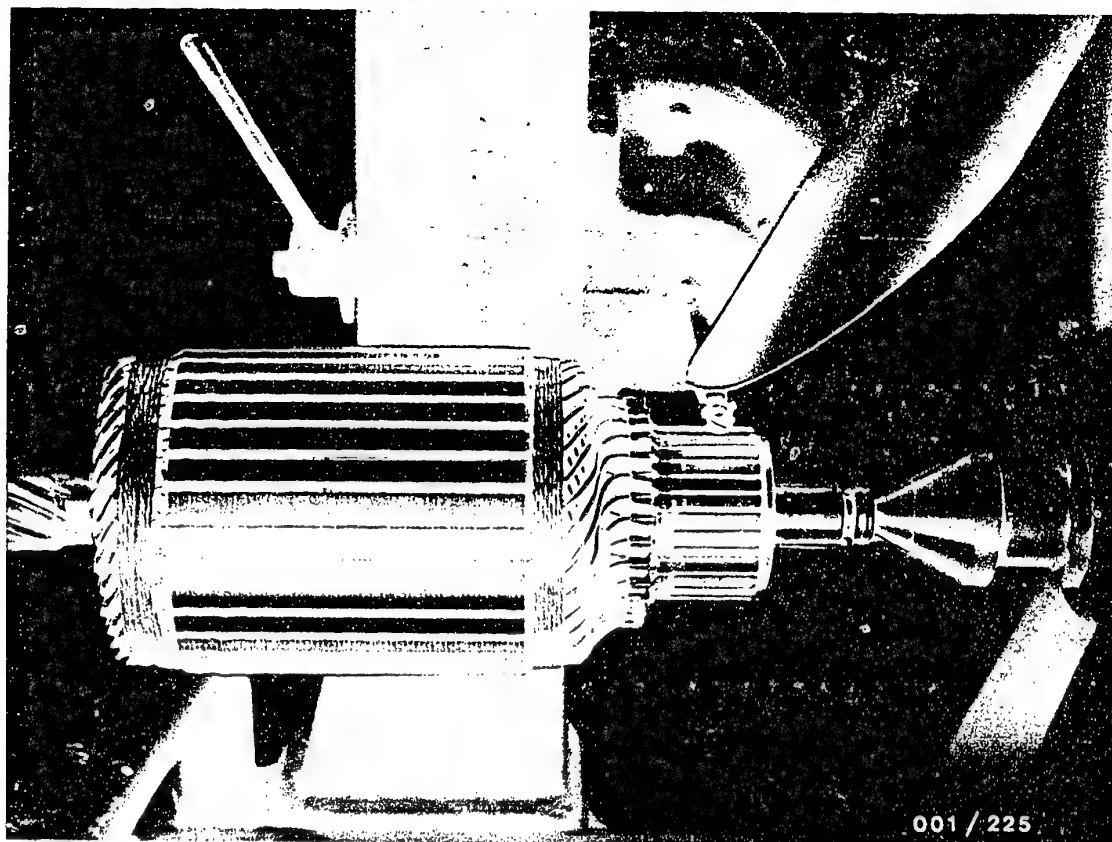
Minimum commutator diameter: 33.5 mm

C7

Examination and repair

G-starting motors 0 001 30. .., 0 001 31.





Undercutting and finish-turning the commutator

Clamp armature in mount of undercutting saw KDAW 9998. Cut out insulation between the laminations to a depth of 0.8 mm.

Note:

The insulation between the commutator laminations contains asbestos; the dust which is released must be extracted. Health hazard.

Finish-turning:

Re-clamp commutator in lathe and turn down with a fine tool.

Chips may be at most 0.03 mm thick.

After finish-turning, brush out the commutator with a clean brush which is free of oil and grease.

C8

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.



10.8 Repairing the drive-end-bearing housing

Replace sintered bushing in drive-end-bearing housing.

10.9 Repairing the intermediate bearing

Replace sintered bushing in intermediate bearing.

10.10 Repairing the overrunning-clutch drive

Check bearing bushings in drive for wear. Replace if necessary.

It must be possible to turn over the overrunning-clutch drive uniformly without any stiffness. Otherwise replace overrunning-clutch drive.

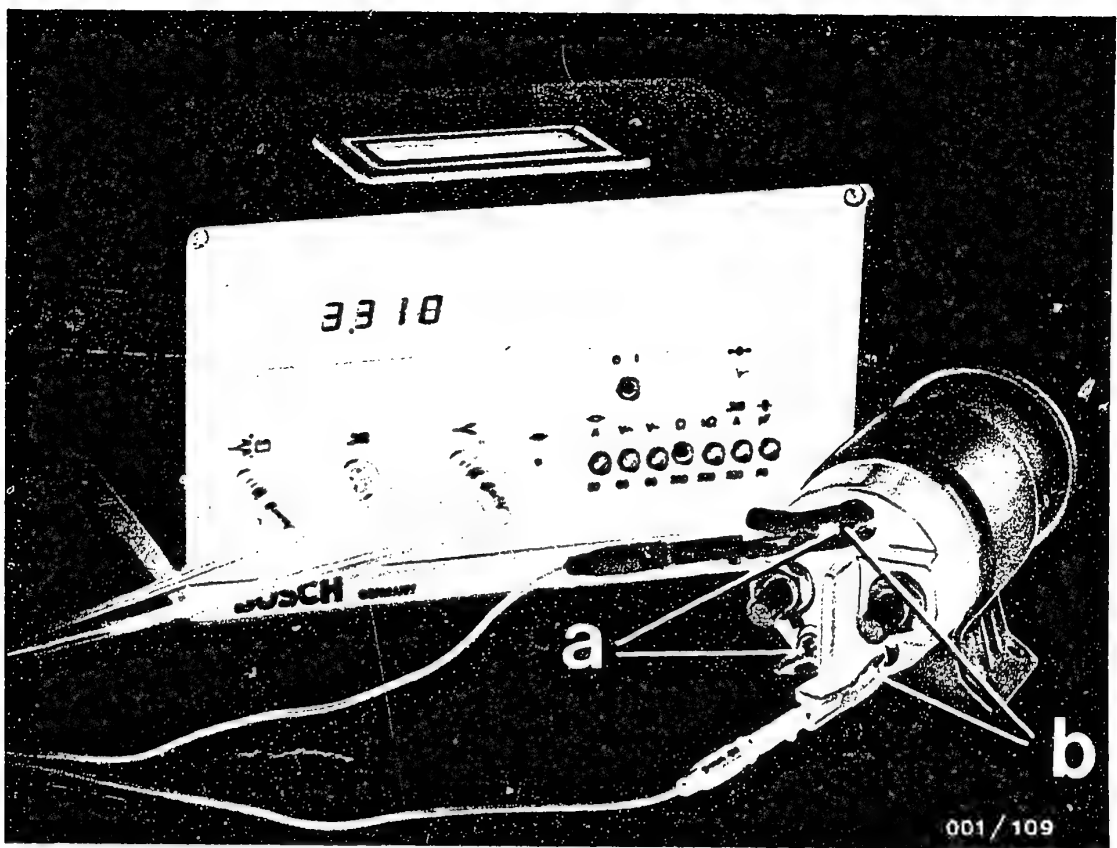
10.11 Repairing the commutator end shield

Replace sintered bushing in commutator end shield.

10.12 Examining the stator frame

Examine the stator frame for damage (visual inspection). If damaged, replace stator frame.





a = Pull-in winding
 b = Holding winding

10.13 Checking the solenoid switch

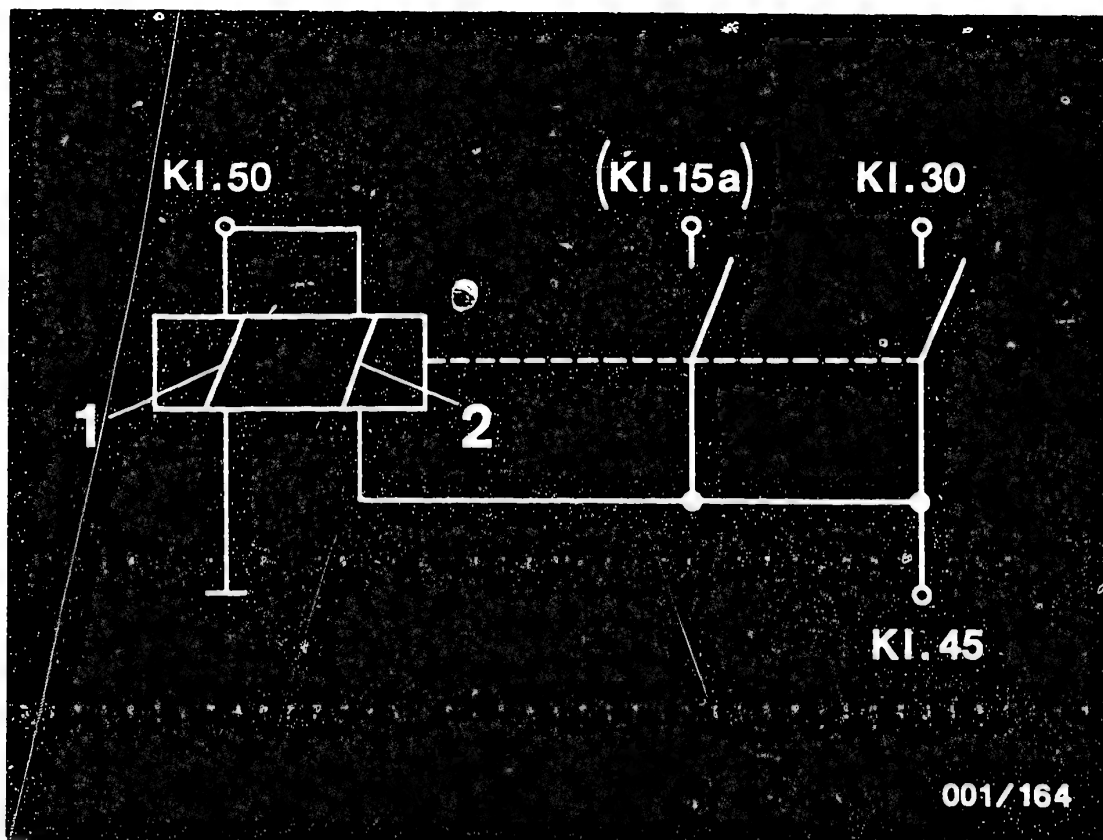
Check for damage.

Check resistance of holding winding and pull-in winding (using electric tester ETE 014.00).

Solenoid switch	Holding winding	Pull-in winding
0 331 302 ..	1.08 ... 1.40 Ω	0.32 ... 0.44 Ω
0 331 303 ..	1.22 ... 1.63 Ω	0.247...0.375 Ω

If performing a functional test, apply voltage to pull-in winding for max. 4 sec and to holding winding for max. 90 sec.





1 = Pull-in winding

2 = Holding winding

Note:

If several solenoid switches are being checked simultaneously, be sure not to mix up the solenoid armatures and springs (armature is matched to relay).

Electrical test at approx. + 20°C

Position for testing: Relay vertical, solenoid armature at top.

Note:

Solenoid armature and return spring are not firmly connected to the solenoid switch, i.e. the solenoid armature is thrown out when testing. To prevent damage to the solenoid armature when testing, limit the deenergization movement of the solenoid armature by means of a flexible stop (hard rubber).



Solenoid switch, continuity test and insulation test

Set test panel to 6 V d.c. and test windings for continuity with test prods.

Check insulated bus bars and windings for short circuit to ground.

Test voltage for 12 V switch: 40 V a.c.
24 V switch: 80 V a.c.

Testing the pull-in voltage

Set voltage of approx. 3.5 V on voltage stabilizer or battery with sliding resistor or similar.

Connect pull-in winding and holding winding as shown in top diagram.

Connect test lamp between + 12 V and term. 30 and connect voltmeter between term. 50 and ground.

Press in solenoid armature entirely. Allow to spring out again by approx. 8 - 10 mm and hold in this position ("solenoid armature gap").

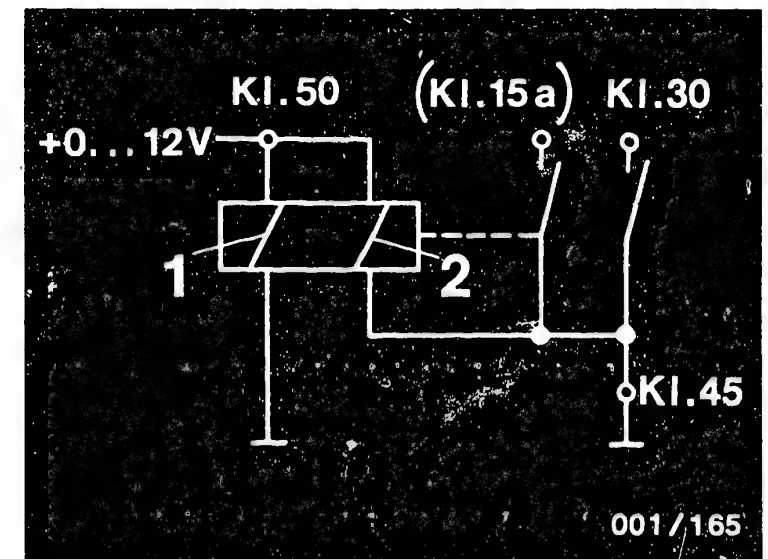
Raise voltage until solenoid armature is pulled in. - Read off value on voltmeter.

At the same time the test lamp must light up (continuity between contacts 30 and 45). Test duration max. 2 seconds.

Pull-in voltage should be:

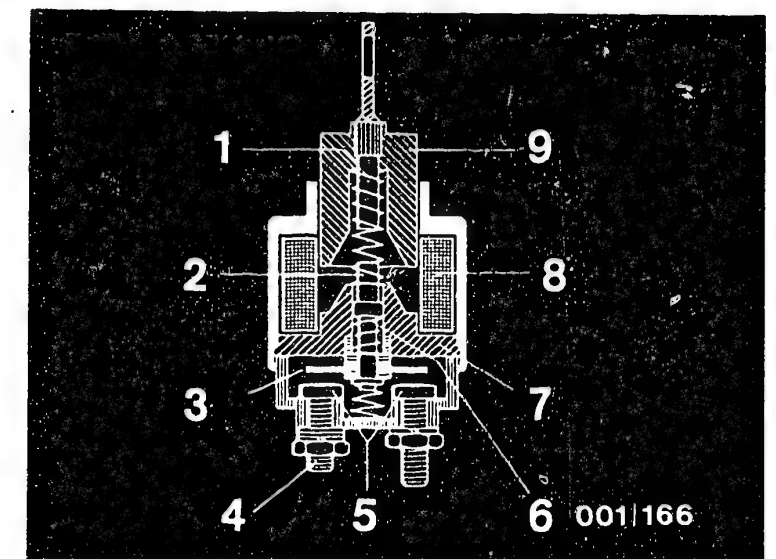
0 331 302 .. 12 V relay: 3 ... 6 V; 24 V relay: 9 ... 12 V
0 331 303 .. 12 V relay: 3.5...7.3V; 24 V relay: 11... 15 V*

* Test with 0.2 Ω resistor in series with pull-in winding.



1=Holding winding
2=Pull-in winding

1=Return spring
2=Switching pin (split)
3=Bridging contact member
4=Terminal stud (term. 45)
5=Contacts
6=Contact pressure spring
7=Magnetic core
8=Winding
9=Solenoid armature



C12

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.



C13

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.



Checking the solenoid switch release voltage (only with holding winding)

Disconnect pull-in winding from ground.

Press in solenoid armature by hand. Increase voltage until solenoid armature is held by holding winding.

Reduce voltage until solenoid armature springs out again.

Release voltage:

0 331 303 .. 0.2 ... 2.0 V 12 V relay; 0.2 ... 4.0 V 24 V relay
0 331 302 .. 0.05 ... 0.4 V 12 V relay; 0.1 ... 0.8 V 24 V relay

Checking the burn-off reserve

Pull-in winding disconnected from ground.

Press in solenoid armature (is held only by holding winding).

When continuity at contacts is indicated by the lighting up of the test lamp, it must be possible to move the solenoid armature another approx. 1 mm in the direction of the magnetic core.

Checking relay windings for interturn short circuit at double nominal voltage (=24 V)

Apply double nominal voltage to terminal stud term. 30 and ground on relay housing.

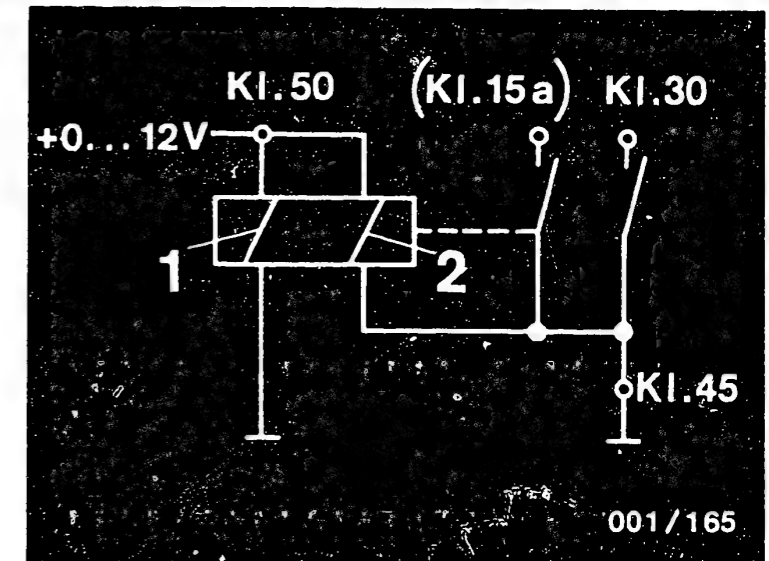
Press in solenoid armature until it rests on magnetic core.

Release solenoid armature again.

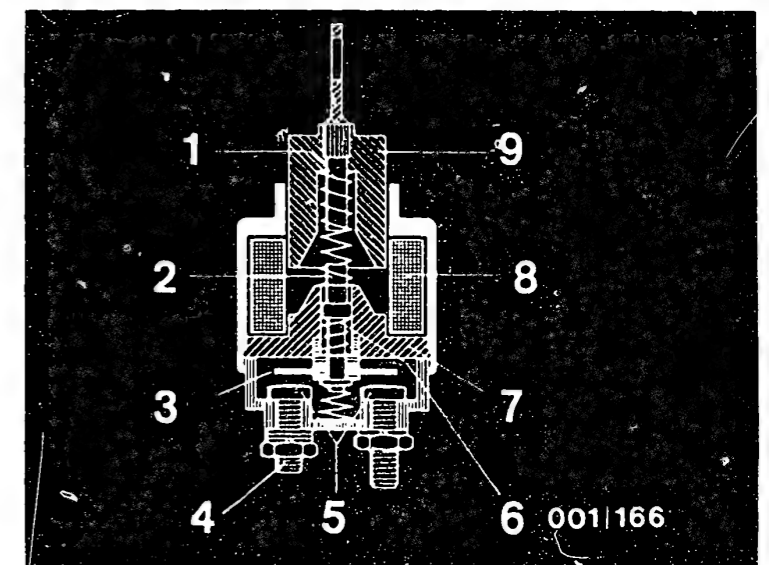
Solenoid armature must spring out automatically due to pressure of return spring. Otherwise, one of the two relay windings has an interturn short circuit.

Only for solenoid switches with term. 15 a

Using test lamp, test for continuity between term. 15 a and terminal stud term. 45. Fully press in solenoid armature by hand and allow to spring out again.



- 1=Holding winding
- 2=Pull-in winding
- 1=Return spring
- 2=Switching pin (split)
- 3=Bridging contact member
- 4=Terminal stud
- 5=Contacts
- 6>Contact pressure spring
- 7=Magnetic core
- 8=Winding
- 9=Solenoid armature



C14

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.



C15

Examination and repair

G-starting motors 0 001 30. ..., 0 001 31.



Mechanical test of solenoid switch

Burn-off reserve:
Starting motor

0 001 304 .. to .. 308..		
.. 310 ..		
.. 311 ..		
.. 313 .. to .. 315 ..	0.9 ...	1.5 mm
.. 312 1..., .. 316 .., .. 317 ..	0.7 ...	1.5 mm
.. 307 019	0.9 ...	1.6 mm
.. 311 1..		
.. 312 104, .. 105	0.8 ...	1.2 mm

Lightly grease solenoid armature with special lubricating grease 5 932 240 150.

Under no circumstances may grease get onto the end face of the solenoid armature.

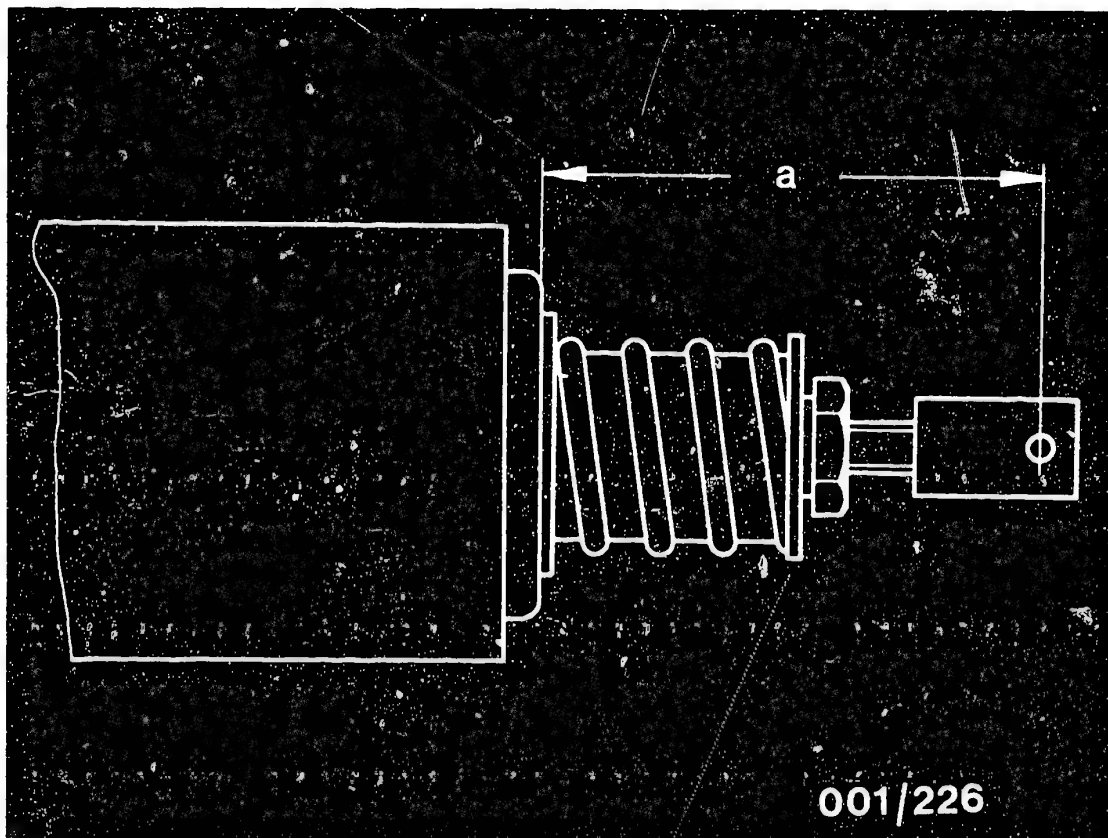
If excessive grease is applied, it will be pressed into the switching chamber, thereby causing contact problems.

C16

Examination and repair

G-starting motors 0 001 30. .., 0 001 31.





a = Adjusting dimension (if adjustable)

Adjust when removed.

Measure adjusting dimension "a" with the relay pulled in. Possibility of adjustment on relay as per picture: Loosen nut and screw fork in or out. Tighten nut.

Note: Different-type relays are adjusted with shims (see service-parts list).

Starting motor	0 001 304 ..	0 001 305 ..	
	0 001 306 ..	0 001 307 ..	32.2 ± 0.1 mm
	0 001 307 019		34 ± 0.1 mm
	0 001 308 ..		42 ± 0.1 mm
	0 001 310 ..,	0 001 311 ..	
	0 001 313 ..,	0 001 314 ..	
	0 001 315 ..		19 ± 0.1 mm
	0 001 311 1..		28.5 ± 0.2 mm
	0 001 312 1..		23 ± 0.15 mm
	0 001 312 104,	0 001 312 105	31 ± 0.2 mm

C17

Examination and repair

G-starting motors 0 001 30. .., 0 001 31.



11. Assembling the starting motor

11.1 Mounting the intermediate bearing and pinion with overrunning clutch

Lightly oil the pinion bearing surface with oil (5 962 260 605).
Lightly grease the spiral spline with special lubricating grease (5 932 240 150).

Starting motor: 0 001 304 .. to .. 308 ..
 .. 310 .. to .. 316 ..

Slide end shield, spacer sleeve and pinion with overrunning clutch onto armature shaft (see top picture).

Starting motor: 0 001 317 ..

Slide end shield and pinion with overrunning clutch, fork lever and bearing block onto armature shaft.

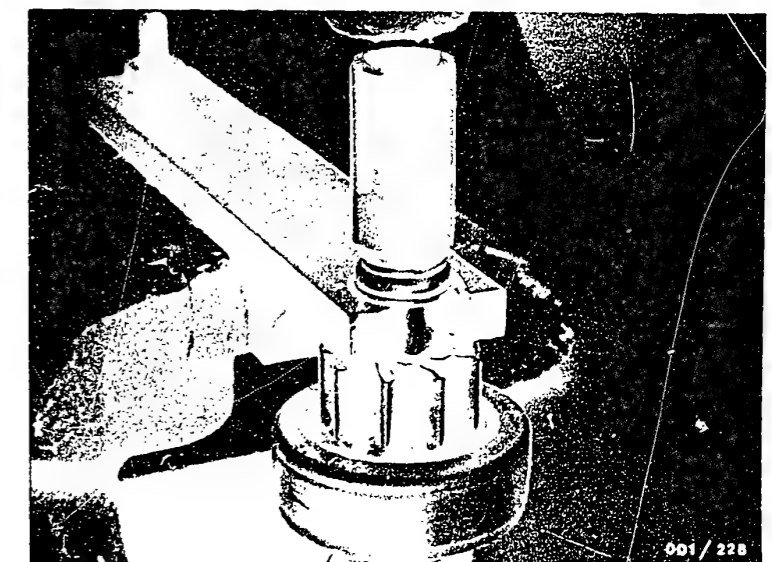
Slide stop ring onto armature shaft. Using suitable pliers, slightly open new retainer and insert into armature ring groove. Do not scrape armature shaft when doing this. Close retainer in ring groove.

Slide mounting sleeve KDAL 5028 onto armature shaft (machined side of sleeve points toward retainer) and calk stop ring with KDAL 5487 (see bottom picture).

Check overrunning torque with spring scale KDAL 5482 or 5485.

Starting motor	Specifications
0 001 304 ..;	0.06 ...0.1 Nm
0 001 305 ..; 0 001 306 ..; 0 001 308 ..; 0 001 310 ..;	0.14...0.22 Nm
0 001 311 ..; 0 001 313 ..; 0 001 315 ..; 0 001 316 ..;	
0 001 307 ..	0.26...0.32 Nm
0 001 308 1..	0.28...0.4 Nm
0 001 312 1..	0.18...0.28 Nm
0 001 314 ..	0.14...0.22 Nm
0 001 317 ..	0.22...0.28 Nm ¹⁾

1) Overrunning torque uprated as of 4.79.



C18

Assembling the starting motor

G-starting motors 0 001 30. ...,0 001 31.

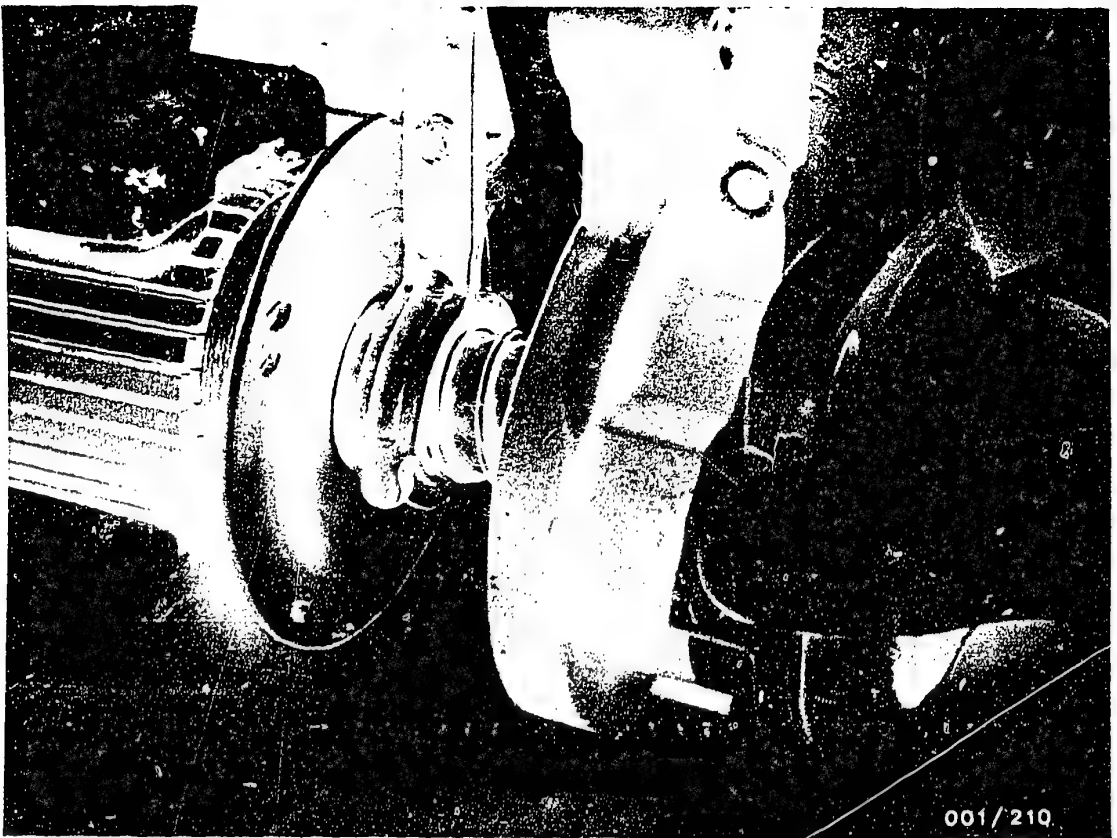


C19

Assembling the starting motor

G-starting motors 0 001 30. ...,0 001 31.





11.2 Installing the armature shaft

Starting motors 0 001 304 .. to 308 .., ..310 to ..316..

Grease fork lever with silicone grease (5 700 082 025).
Insert armature shaft with pinion, overrunning clutch,
fork lever and intermediate bearing into drive-end-bearing
housing.

Screw in bearing screw for fork lever.

Insert fasteningscrews for intermediate bearing (in the
case of splashproof starting motors with sealing putty
5 703 452 150) and tighten to 5.5 ... 8.0 Nm.

Insert gasket and rubber seal.

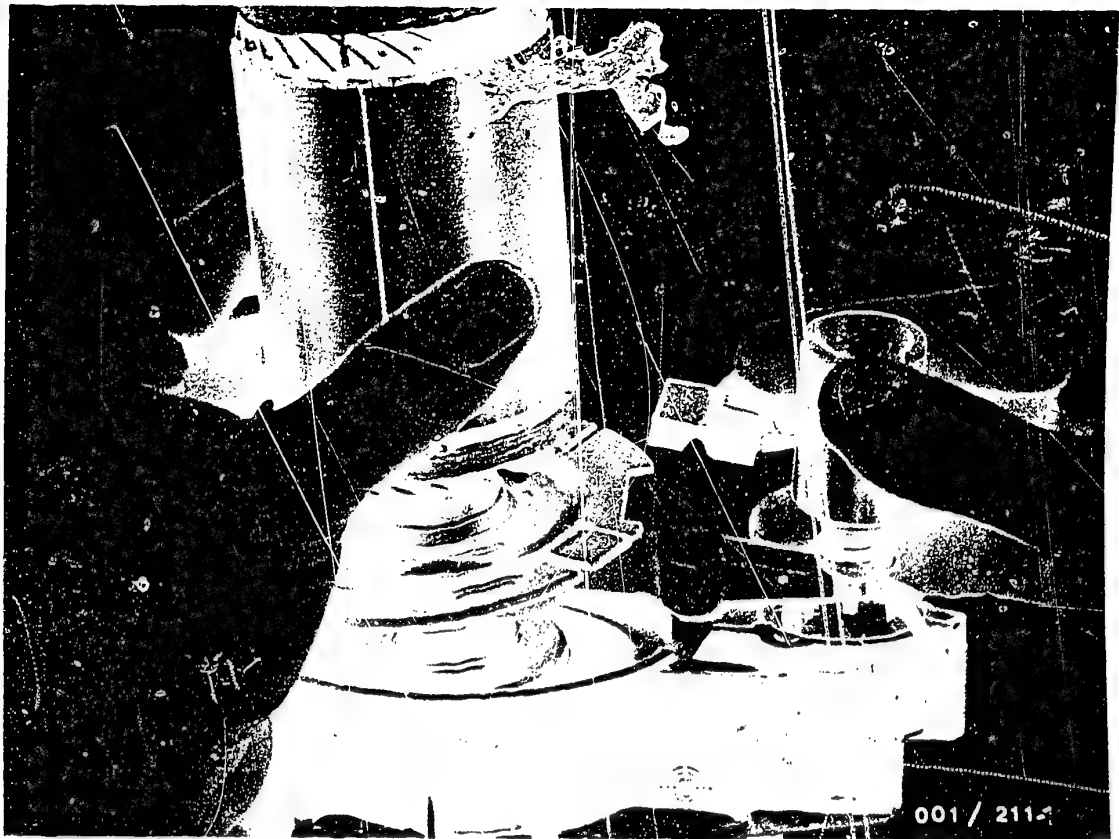
Note: When mounting solenoid switch 0 331 303.. on
starting motor 0 001 312 108, the spring seat on the
relay armature must be mounted with the opening to the
top.

C20

Assembling the starting motor

G-starting motors 0 001 30. ..., 0 001 31.





11.2.1 Installing the armature shaft Starting motor 0 001 317 ..

Grease the fork lever with silicone grease (5 700 082 025).

Hook relay armature into fork lever.

Insert armature shaft with pinion, overrunning clutch, fork lever and bearing block, intermediate bearing and relay armature into drive-end-bearing housing (recess on intermediate bearing points toward bearing block/relay, see picture).

Insert rubber seal (counter-bearing for bearing block).

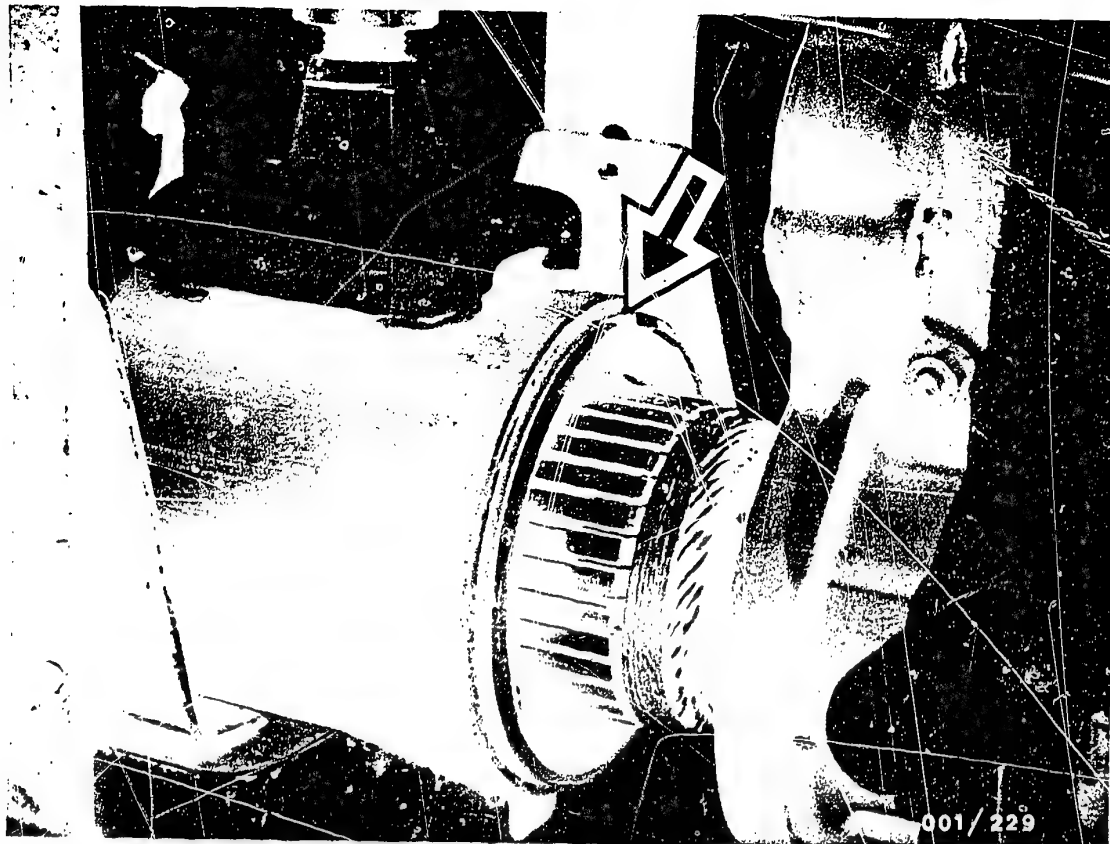
Note: When mounting solenoid switch 0 331 303 .., the spring seat on the relay armature must be mounted with the opening to the top (see picture, arrow).

C21

Assembling the starting motor

G-starting motors 0 001 30. .., 0 001 31.





11.3 Mounting the stator frame

Clamp stator frame in clamping support (KDAL 9999). Introduce armature into stator frame and place drive-end-bearing housing on stator frame. Groove on stator frame (see picture, arrow) fits onto sealing rubber in drive-end-bearing housing.

In the case of splashproof starting motors (0 001 316 ..), replace O-rings on stator frame and additionally coat the sealing surfaces evenly and thinly with sealing putty 5 703 452 150.

Flameproof starting motors 0 001 311 042, .. 127, .. 314 025 and .. 314 032:
These starting motors are intended for export to the USA



for gasoline-operated marine engines. The US Coast Guard regulations for gasoline-operated marine engines require that the products of the electrical engine equipment be protected against flames. This is intended to guarantee that there is no inflammation even when operated in a combustible atmosphere.

On Bosch starting motors, this flameproof protection is guaranteed by the normal sealing of the electrical part with the intermediate bearing/drive-end-bearing housing and the commutator end shield.

When carrying out repairs, make sure that these parts are correctly sealed.

When assembling, coat the joints between stator frame and drive-end-bearing housing/intermediate bearing with sealing putty 5 703 452 150 (Kkiv3).

There must be no additional holes or penetrations in the starting motor housing.

C23

Assembling the starting motor

G-starting motors 0 001 30. ..,0 001 31.



11.4 Mounting the brush holder plate and carbon brushes

Starting motors 0 001 304 .. to .. 308 ..
.. 310 .. to .. 316 ..

Place the brush holder plate on the armature shaft.

Insert carbon brushes into brush holder (see top picture).

Check brush pressure with spring scale:

Starting motor

0 001 310 .., 0 001 311 .., 0 001 315 ..,

Brush pressure

Specification: 11.5...13.5 N

0 001 311 1., 0 001 312 .., 0 001 313 ..,
0 001 314 .., 0 001 316 ..,

Specification: 18...21 N

0 001 304 .., 0 001 305 .., 0 001 306 .., 0 001 307 ..,

0 001 308 ..

Specification: 9...10.5 N

0 001 307 019

Specification: 13...15 N

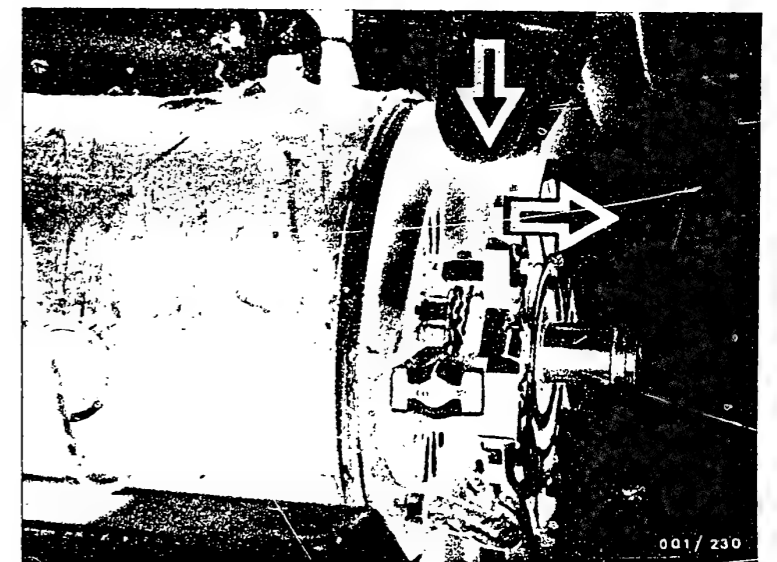
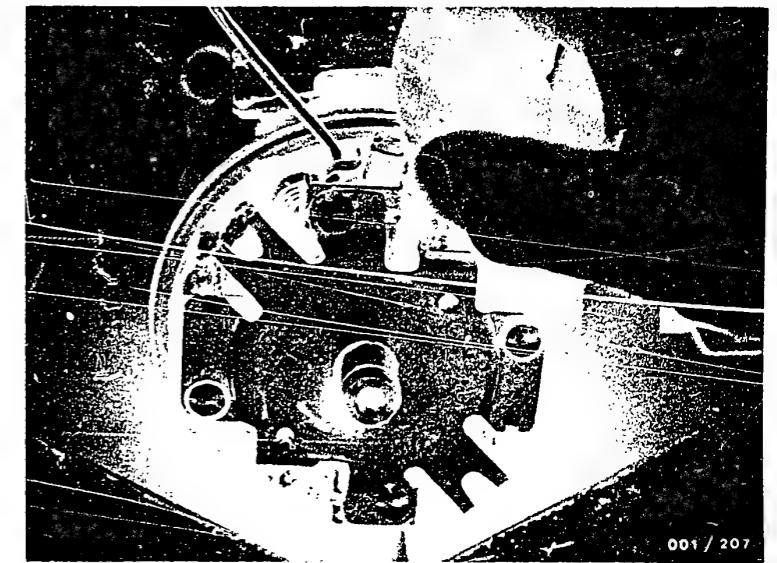
0 001 312 104, 0 001 312 105

Specification: 15...17 N

11.4.1 Starting motor 0 001 317

Hang brush holder plate over commutator.

Slide pocket-type brush holder with spiral spring onto brush and press against commutator. At the same time, press brush holder against brush holder plate until the holding lug latches into the brush holder plate (see bottom picture, arrows).



D1

Assembling the starting motor

G-starting motors 0 001 30. ..., 0 001 31.

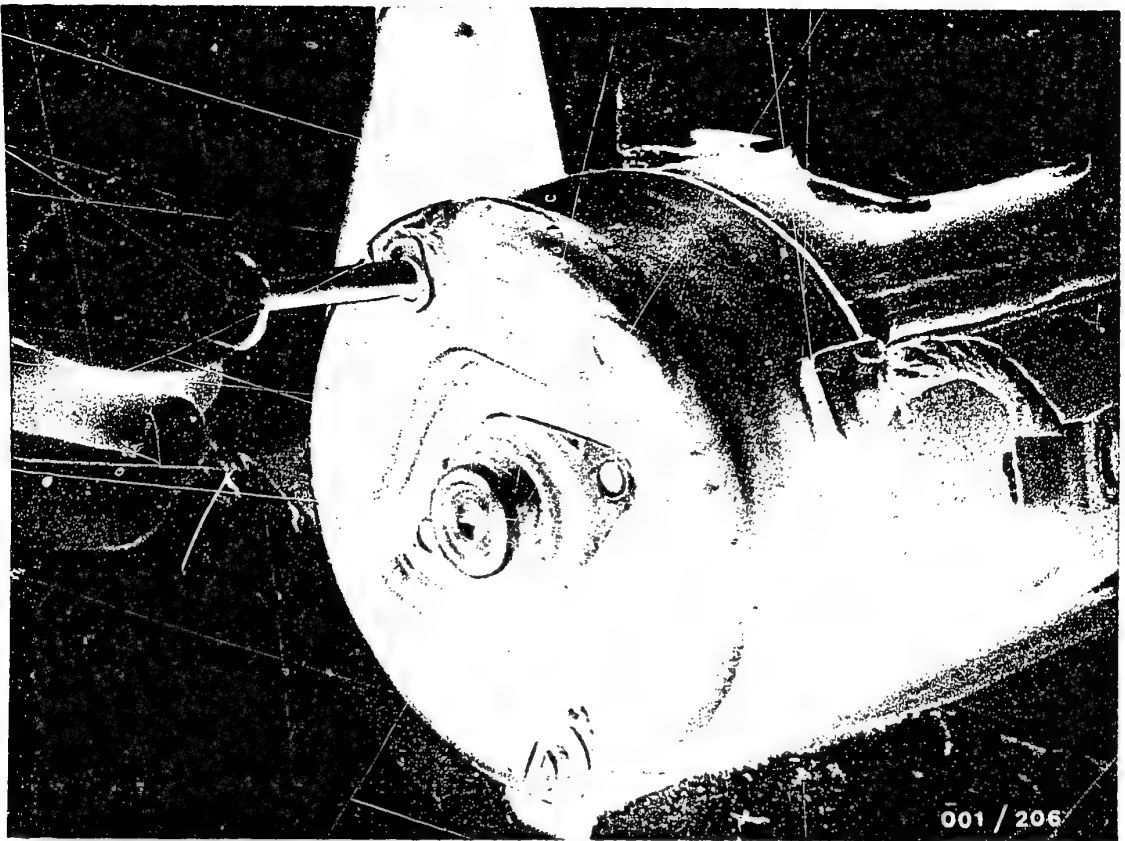


D2

Assembling the starting motor

G-starting motors 0 001 30. ..., 0 001 31.





11.5 Installing the commutator end shield

Install the commutator end shield. Ensure correct seating of the rubber grommet of the connecting lead. Insert through bolts (in the case of splashproof starting motors with sealing putty 5 703 452 150) and tighten to 7.5 ... 9.5 Nm.

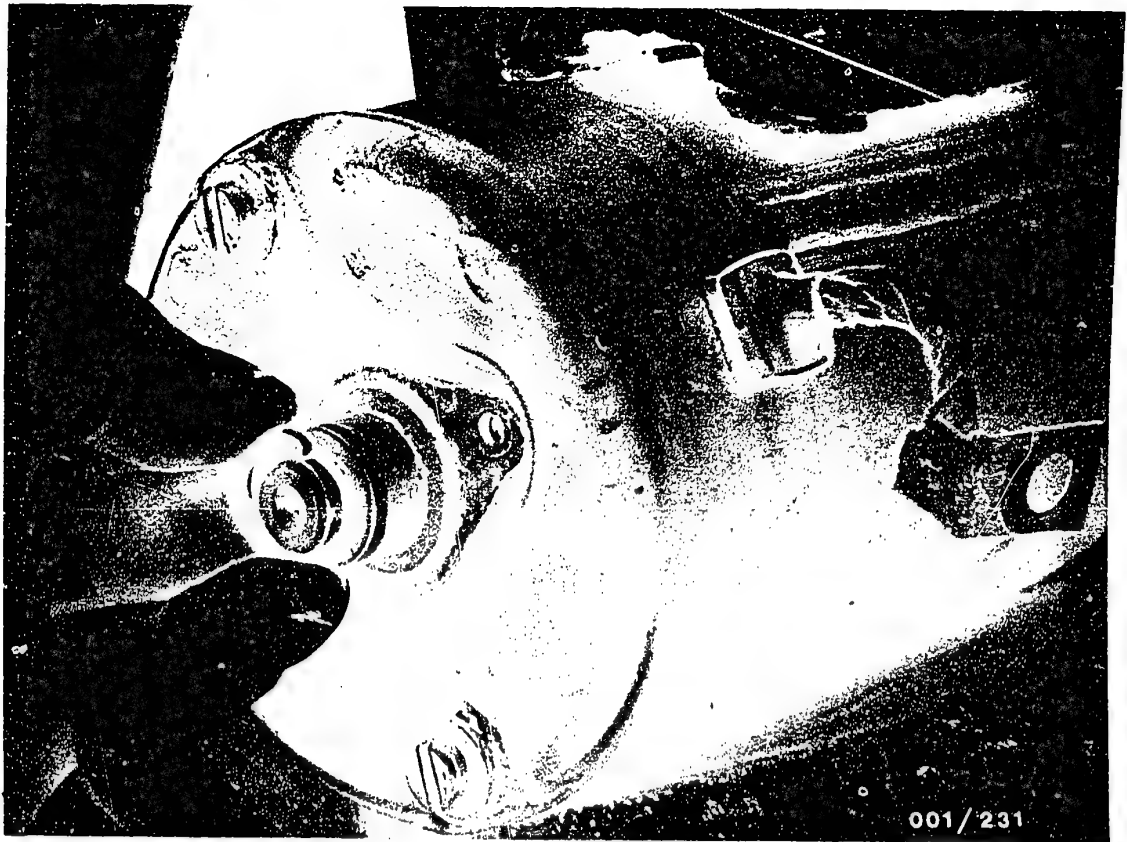
In the case of flameproof starting motors 0 001 311 042, .. 127, .. 314 025 and .. 314 032:
coat joint between stator frame and commutator end shield with sealing putty 5 703 452 150.

D3

Assembling the starting motor

G-starting motors 0 001 30. ..., 0 001 31.





11.6 Checking and adjusting the armature longitudinal play

Slide holding washer and shim without grease onto armature shaft. Check armature longitudinal play with feeler gauge between holding washer and shim. Using appropriate shims, adjust to:

Starting motor 0 001 304 .. to .. 308 ..;	
0 001 311 042; 0 001 311 1.;	
0 001 312 ..	0.1...0.3 mm
0 001 308 1. to 0 001 .. 317 ..	
	0.05...0.3 mm

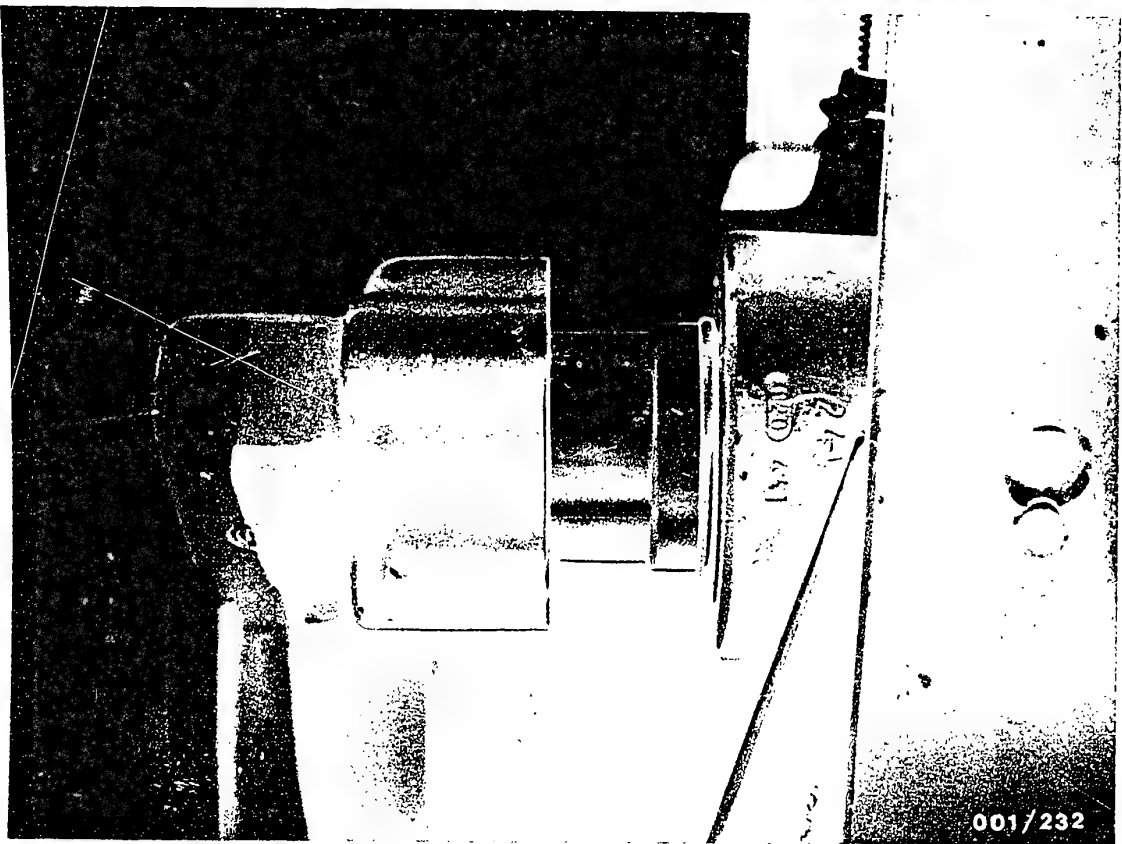
Lightly grease inside of holding washer and shim or closure cap with silicone grease 5 700 082 025 after adjusting the armature longitudinal play. Mount seal and closure cap. Position fastening screws of closure cap (in case of splashproof starting motors with sealing putty 5 703 452 150) and tighten to 1.4 ... 2.0 Nm.

D4

Assembling the starting motor

G-starting motors 0 001 30. ..., 0 001 31.





11.7 Mounting the solenoid switch

Starting motors 0 001 304 .. to .. 308 .., .. 310 .. to 316 ..

Grease solenoid switch armature and eye with special lubricating grease 5 932 240 150 (only on starting motors 0 001 312 1.. with silicone grease 5 700 082 025).

Hook solenoid switch armature into fork lever. Insert solenoid switch housing with solenoid armature return spring.

11.7.1 Starting motor 0 001 317 ..

Lightly grease solenoid switch armature with special lubricating grease 5 932 240 150. Insert solenoid switch housing with solenoid armature return spring.

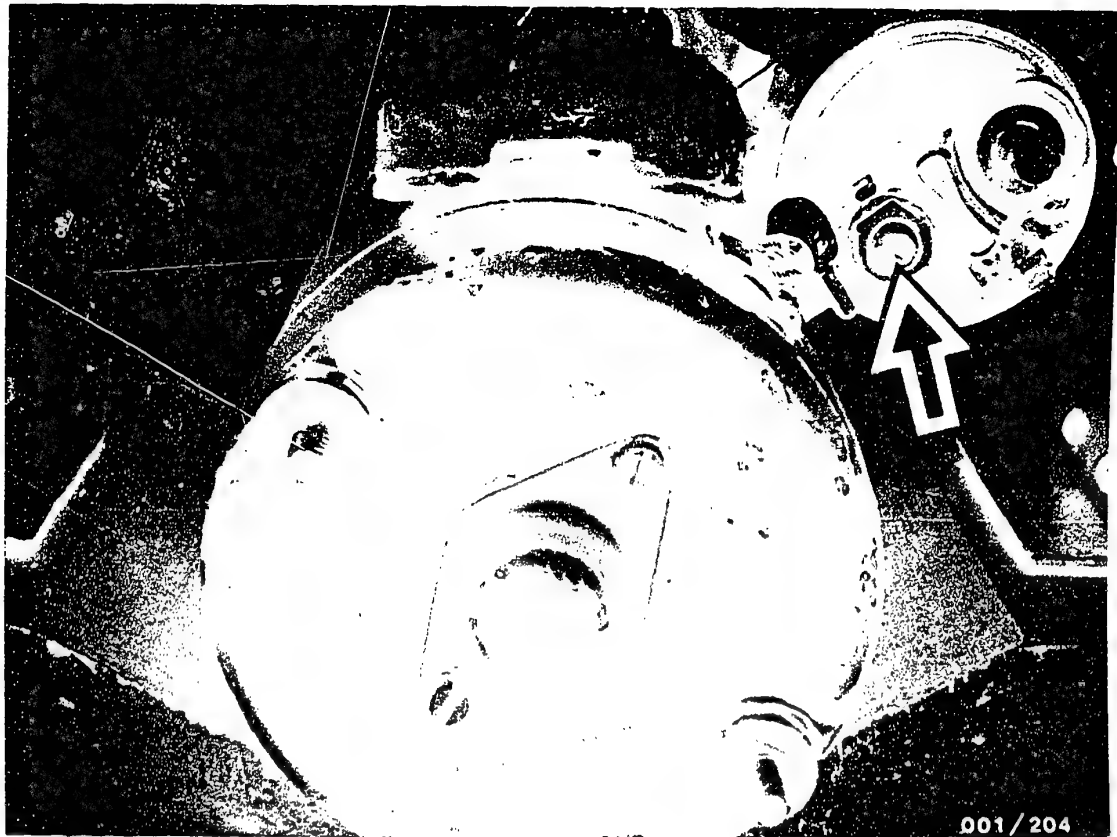
Insert fastening screws for solenoid switch (in case of splashproof starting motors with sealing putty 5 703 452 150) and tighten to 7.5 ... 9.5 Nm with 2xM 6 screws or to 4.5 ... 5.5 Nm with 3xM 5 screws.

D5

Assembling the starting motor.

G-starting motors 0 001 30. .., 0 001 31.





Mount terminal 45 on relay (see picture, arrow).
Tighten nut to 7 ... 9 Nm.

11.8 Checking the armature braking torque with torque-meter KDAL 5485:

Starting	0 001 304 ..;	0 001 305 ..;	
motor	0 001 306 ..;	0 001 307 ..;	Spec.:0.3...0.5 Nm
	0 001 308 ..		
	0 001 310 ..;	0 001 311 ..	Spec.:0.25...0.4 Nm
	0 001 311 042;	0 001 311 1.;	
	0 001 312 ..;	0 001 313 ..;	
	0 001 315 ..;	0 001 316 ..	Spec.:0.3...0.55 Nm
	0 001 317 ..		Spec.:0.3...0.6 Nm

D6

Assembling the starting motor

G-starting motors 0 001 30. ...,0 001 31.



12. Testing on test bench

12.1 General

Usable test benches

EFAL 140 starting motor 0 001 316 .. in conjunction with
10 m Ω series resistor.

EFAL 152 starting motor 0 001 316 .. connection term.30/
2 (with series resistor)

EFAL 153

Mount starting motor correctly on test bench.
Connect positive and negative cables of test bench to
starting motor. Properly tighten electrical connections
(terminal studs).

The electrical test specifications depend on the state
of the battery (capacity and state of charge) and the
test duration (heating of starting motor, discharging of
battery). The test specifications apply only to the test
bench and cannot be used for starting motors installed
on the engine or in the vehicle. A small starting motor
will be loaded more heavily by the battery built into
the test bench, whereas, in the case of the largest
types of starting motor, the capacity of the test bench
battery is not sufficient to produce the maximum power.
The unavoidable long leads in the test bench also influ-
ence the power of the starting motor. Therefore, the
test time should be kept as short as possible and the
battery should be in proper condition and at least three
quarters charged.

In the case of defective starting motors, the measured
values differ considerably from the stated test specifi-
cations. In this case, dismantle the starting motor once
again and repeat the checks on the individual components.

D7

Testing on test bench

G-starting motors 0 001 30. .., 0 001 31.



12.2 Testing

Note:

Do not mix up connections.

+ from test bench to solenoid switch term. 30

- from test bench to test bench ground

Testing of solenoid switch with tooth/tooth connection
on test bench EFAL 152/153 with tester for relay pull-
in voltage

Clamp starting motor so that the clearance between pinion and tooth of test bench is max. 2 mm.

Connect voltmeter with + clamp to terminal 50. Turn knob of brush plate resistor as far as it will go to the left.

Switch on tester.

Turn knob of brush plate resistor to the right until indicator lamp comes on.

The solenoid switch has now pulled in.

Watch voltage rise on voltmeter and read off value when indicator lamp comes on.

Specification for pull-in voltage:

0 001 304 ..; 0 001 310 ..	$\leq 3.5 \text{ V}$
0 001 305 ..; 0 001 306 ..;	
0 001 307 ..; 0 001 311 ..;	
0 001 312 ..; 0 001 313 ..;	
0 001 314 ..; 0 001 315 ..;	
0 001 317 ..	$\leq 7.5 \text{ V}$
0 001 312 1.	$\leq 8 \text{ V}$
0 001 308 ..	$\leq 15 \text{ V}$
0 001 316 ..	$\leq 17.5 \text{ V}$

D8

Testing on test bench

G-starting motors 0 001 30. .., 0 001 31.



Testing the solenoid switch with tooth/tooth connection
on other test benches

Clamp the starting motor so that the clearance between pinion and ring gear of test bench is max. 2 mm.
During testing, + from test bench must not be connected to term. 30 on starting motor.

With voltage stabilizer (12 V approx. 25 A) or 12 V battery with sliding resistor or similar, raise voltage until solenoid switch pulls in.

Specification for pull-in voltage:

0 001 304 ..; 0 001 310 ..;	$\leq 3.5 \text{ V}$
0 001 305 ..; 0 001 306 ..;	
0 001 307 ..; 0 001 311 ..;	
0 001 312 ..; 0 001 313 ..;	
0 001 314 ..; 0 001 315 ..;	
0 001 317 ..	$\leq 7.5 \text{ V}$
0 001 312 1.	$\leq 8.0 \text{ V}$
0 001 308 ..	$\leq 15 \text{ V}$
0 001 316 ..	$\leq 17.5 \text{ V}$

D9

Testing on test bench

G-starting motors 0 001 30. ..., 0 001 31.



12.3 No-load and short-circuit test

The test specifications are based on two 12 V / 143 Ah batteries 3/4 fully charged with a 10 mΩ resistor connected in series; or one 12 V / 143 Ah battery with 10 mΩ resistor in series.

No-load values

0 001 304	..	for	5.5 V	≤ 75 A	> 4000 min ⁻¹
0 001 305	..	for	11 V	≤ 50 A	> 5500 min ⁻¹
0 001 306	..	for	11.5 V	≤ 50 A	> 5500 min ⁻¹
0 001 307	..	for	11.5 V	≤ 70 A	> 6300 min ⁻¹
0 001 308	..	for	23.5 V	≤ 35 A	> 6000 min ⁻¹
0 001 308	1.	for	23.5 V	≤ 50 A	> 6000 min ⁻¹
0 001 310	..	for	5.5 V	< 65 A	> 4500 min ⁻¹
0 001 311	..	for	11.5 V	< 50 A	> 5500 min ⁻¹
0 001 311	033	for			
	043	for	11.5 V	< 50 A	> 5800 min ⁻¹
0 001 311	042				
	047				
	050				
	056				
	1..	for	11.5 V	< 70 A	> 7500 min ⁻¹
0 001 312	..	for	11.0 V	< 115 A	> 8500 min ⁻¹
0 001 312	1..	for	11.5 V	≤ 85 A	> 8500 min ⁻¹
0 001 313	..	for	11.5 V	< 80 A	> 8000 min ⁻¹
0 001 314	..	for	11.5 V	< 80 A	> 7500 min ⁻¹
0 001 315	..	for	11 V	< 85 A	> 9000 min ⁻¹
0 001 316	..	for	23.5 V	< 35 A	> 7000 min ⁻¹
0 001 317	..	for	11.5 V	< 80 A	> 7500 min ⁻¹



Short-circuit test

For the short-circuit test, ring gear/tooth segment of the test bench and of the starting motor pinion must have the same module (teeth). Otherwise, exchange the ring gear of the test bench or set a different tooth segment (for module and number of teeth of starting motor pinion see specifications for automotive electrics).

D11

Testing on test bench

G-starting motors 0 001 30. ..,0 001 31.



12.3.1 Backlash

The backlash is the gap (play) between the tooth flanks of the mated pinion and the ring gear/tooth segment.

For reasons of safety, do not connect term. 30 on the starting motor when adjusting the backlash.

Too little or too much backlash causes heavy wear on the teeth and can even lead to the breaking off of entire teeth.

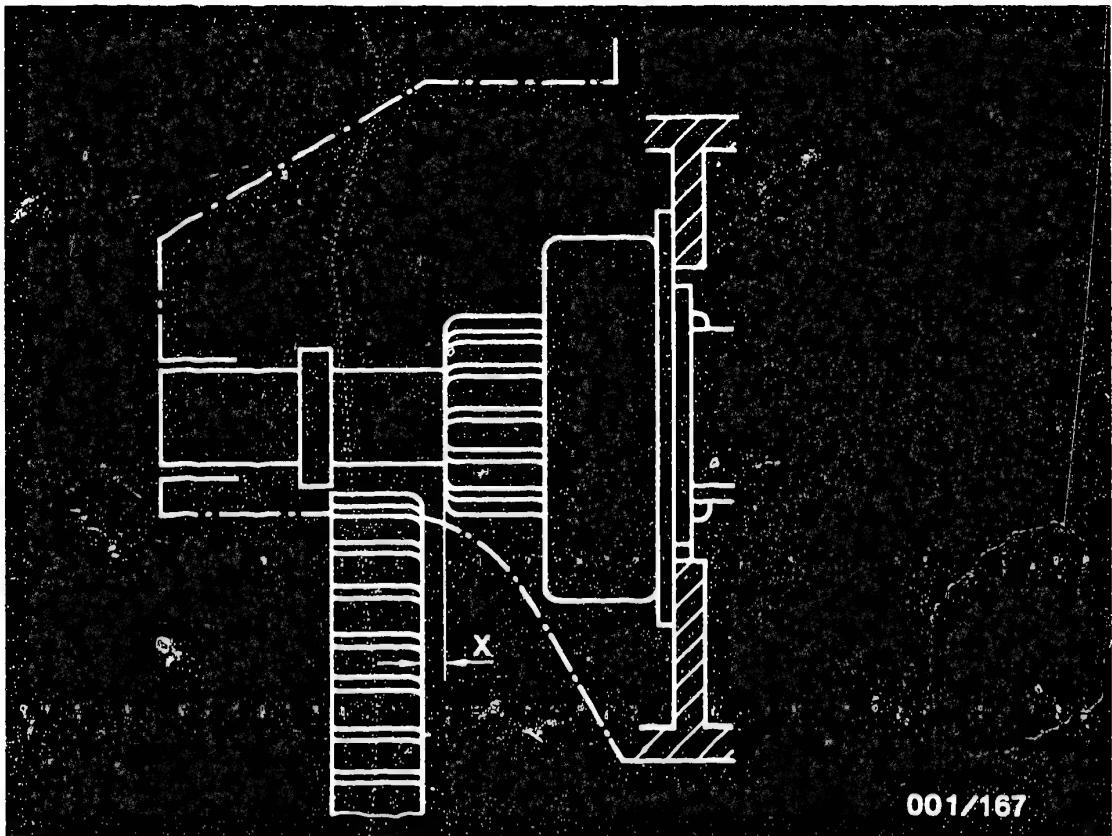
Backlash specified value: 0.3 ... 0.6 mm

D12

Testing on test bench

G-starting motors 0 001 30. .., 0 001 31.





001/167

12.3.2 Pinion clearance

The pinion clearance is the gap between the end face of the ring gear and the end face of the pinion (dimension x) with the starting motor at rest.

If the clearance is too great, the pinion does not mesh far enough into the ring gear. Pinion teeth and ring-gear teeth have insufficient seating surfaces and are therefore heavily loaded on one side.

The minimum clearance is necessary in order to ensure that the pinion safely demeshes, that it does not strike against the turning ring gear in the case of severe jolts and also so that it cannot mesh so far that the overrunning clutch strikes against the ring gear.

Pinion clearance specified value: 2.0 ... 3.0 mm

D13

Testing on test bench

G-starting motors 0 001 30. ..., 0 001 31.



12.3.3 Test procedure for short-circuit test

Adjust starting motor voltage on test bench by means of measuring-range selector switch.

In the case of test benches with gear/ring gear, switch on starting motor and brake to standstill. Take readings. Perform test only briefly, max. 1 to 2 seconds.

In the case of test benches with a fixed tooth segment, switch on starting motor briefly. Take readings.

The following tables give the short-circuit test specifications.

D14

Testing on test bench

G-starting motors 0 001 30. .., 0 001 31.



Part No. of starting motor	1 x 6 V 77 Ah			1 x 12 V 143 Ah or 2 x 12 V 143 Ah in parallel with 10 m Ω resistor (EFAL 152, 153 term. 30/2)			2 x 12 V 143 Ah in series		
	V	A	Torque ¹⁾ > Nm	V	A	Torque ¹⁾ > Nm	V	A	Torque ¹⁾ > Nm
0 001 304 ..	2,5 2,0	290 ... 370 220 ... 300	7 5,5						
305 .. 306 ..				8,5 7,5	360 ... 450 320 ... 400	18 17			
307 ..				7,0 6,0	500 ... 610 430 ... 530	22 18,5			
308 ..							20 19,5	230 ... 320 210 ... 300	22 21
308 1..							20 19	310 ... 400 300 ... 380	26 25
310 ..	2,5 2,0	290 ... 370 220 ... 300	7 5,5						
311 ..				8,5 7,5	350 ... 450 310 ... 400	18 16			
311 043 311 033				7 6	400 ... 490 330 ... 420				
311 042 047 050 056				7,5 6,5	480 ... 560 410 ... 490	12 10			
311 1..				7,4 6,5	480 ... 560 410 ... 490	16 15			

1) only for test benches with torque tester

D15

Testing on test bench

G-starting motors 0 001 30. ..., 0 001 31.



D16

Testing on test bench

G-starting motors 0 001 30. ..., 0 001 31.



Part No. of starting motor	1 x 12 V 143 Ah or 2 x 12 V 143 Ah in parallel with 10 m Ω resistor (EFAL 152, 153 term. 30/2)			2 x 12 V 143 Ah in series with 10 m Ω resistor (EFAL 152, 153 term. 30/2)		
	V	A	Torque ¹⁾ > Nm	V	A	Torque ¹⁾ > Nm
0 001 312 ..	5 4	660 ... 780 520 ... 620	15 12			
312 1..	6 5	650 ... 730 530 ... 720	19 16			
313 ..	6 5	520 ... 610 430 ... 520	17 15			
314 ..	6 5	690 ... 780 560 ... 650	22 19			
315 ..	5,5 5,0	680 ... 830 610 ... 750				
316 ..				19 18	290 ... 360 270 ... 340	25 24
317 ..	5,5 5,0	700 ... 820 650 ... 750	22 20			

1) only for test benches with torque tester

D17

Testing on test bench

G-starting motors 0 001 30. .., 0 001 31.



D18

Testing on test bench

G-starting motors 0 001 30. .., 0 001 31.



After-sales Service

Technical Bulletin

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HEALTH HAZARD DUE TO ASBESTOS DUST
Note on repair
Extractor for undercutting (commuta-
tor) saw

VDT-I-Gen. 043 En
12.1981
supersedes edition of 11.1981

Working on asbestos or products containing asbestos results in the generation of dust and minute fibers which can in the long term lead to serious damage to health.

The European Community passed a law on 28 March 1981 restricting the use of asbestos and providing for new safety regulations with regard to working with materials containing asbestos.

Note on the repair of starting motors, generators and motors

The insulation between the commutator segments of the armatures of starting motors, generators and motors still has a high asbestos content.
It is absolutely essential to extract the asbestos dust generated when undercutting this insulation with undercutting saw KDAW 9998.

As laid down in new VDI guidelines, the asbestos dust must only be extracted with an approved dirt extractor.

We therefore recommend the dirt extractor WAP-turbo M-I S-FA with the seal of approval of the German employers' liability insurance association, obtainable from

Firma Guido Oberdorfer
WAP-Maschinen
D-7919 Bellenberg
Tel. 07306/5055

BOSCH

Geschäftsbereich KH Kundendienst, Kfz-Ausstattung
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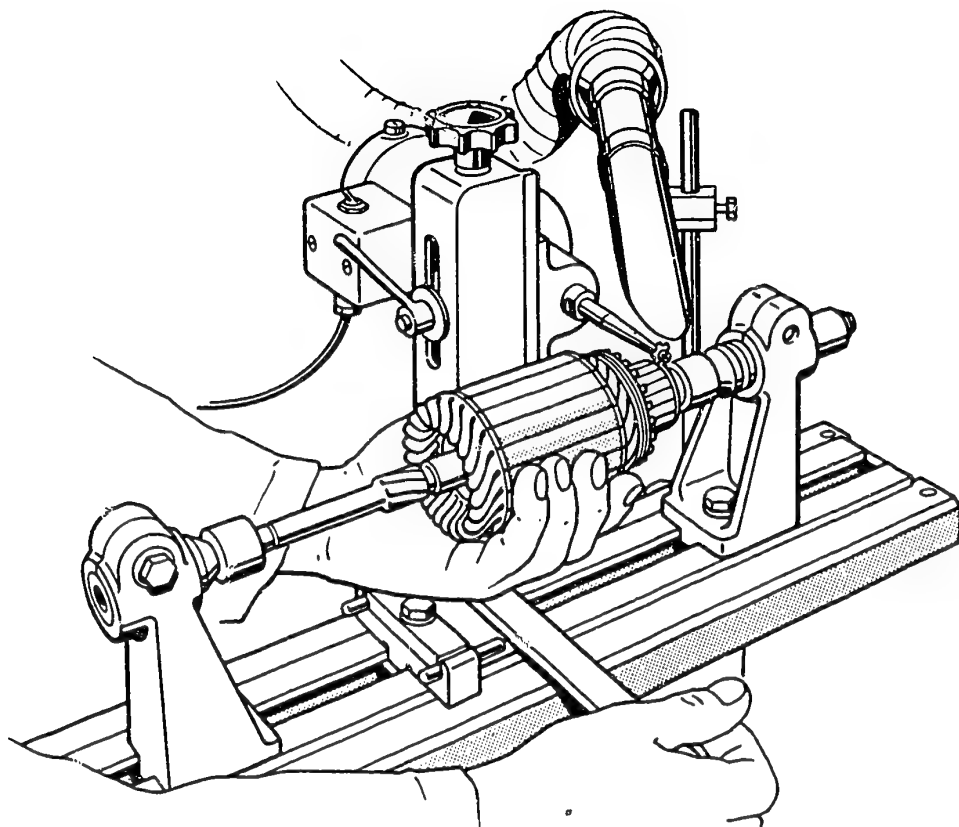
N1

Technical Bulletin

G-starting motors 0 001 30. .., 0 001 31.



As an accessory for the extractor we offer the stand KDAW 9998/20 which can be used for securing the suction tube with nozzle (see sketch).



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